DIT UNIVERSITY

IMAGINE ASPIRE ACHIEVE

Course Structure and Syllabus

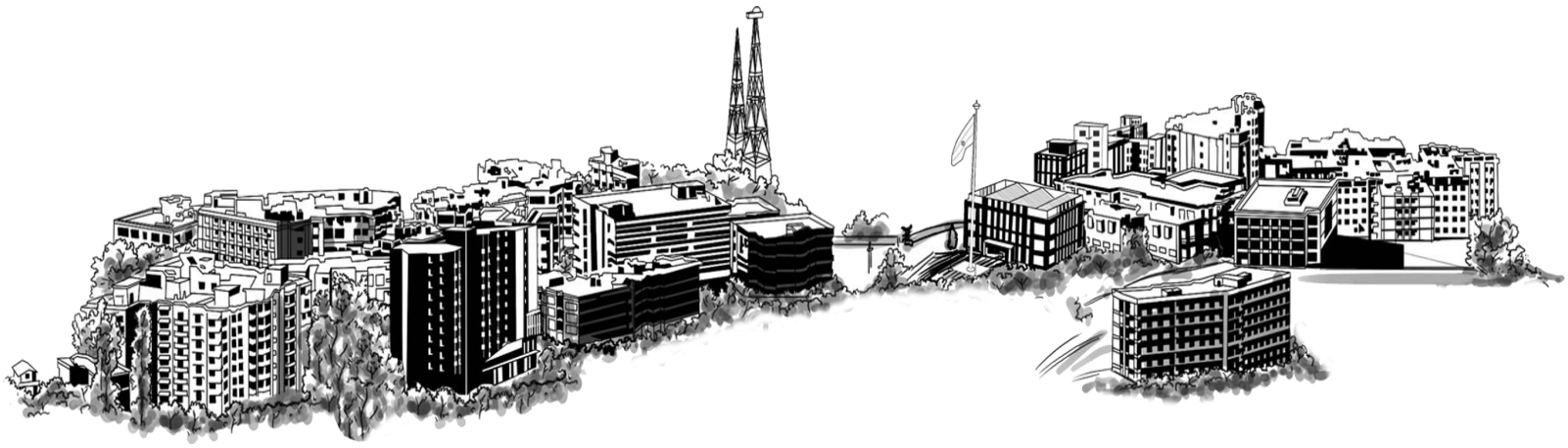
All Programmes

Applicable for 2016 batch

DIT University

Mussoorie Diversion Road,

Dehradun, Uttarakhand – 248009



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DIT UNIVERSITY
Dehradun

Course Structure & Detailed Syllabus

of

B. ARCH.

Batch 2016-21

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Year: 1st **Semester: I**

Course Code	Course Title	L / S	T	P	Credits
AA1S11	Architectural Design-I	6	0	0	6
AA1S21	Construction & Materials-I	6	0	0	6
AA1011	Architectural Structures-I	2	0	0	2
AA1S31	Architectural Drawing-I	6	0	0	6
AA1S41	Arts & Graphics- I	4	0	0	4
AA1110	Workshop/ Model Making	0	0	1	0.5
HA1210	Professional Communication-I	2	0	1	2.5
HA1030	Soft Skills- I	0	0	2	1
	Total				**28**

***L /S- Lecture/ Studio

Year: 1st **Semester: II**

Course Code	Course Title	L / S	T	P	Credits
AA2S11	Architectural Design-II	6	0	0	6
AA2S21	Construction & Materials-II	6	0	0	6
AA2011	Architectural Structures-II	2	0	0	2
AA2S31	Architectural Drawing-II	5	0	0	5
AA2S41	Arts & Graphics- II	4	0	0	4
AA2110	Surveying & Leveling	0	0	2	1
AA2120	Computer Application-I	0	0	2	1
HA2230	Professional Communication-II	2	0	1	2.5
	Total				**27.5**

***L /S- Lecture/ Studio

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Year: 2nd **Semester: III**

Course Code	Course Title	L / S	T	P	Credits
AA3S10	Architectural Design-III	9	0	0	9
AA3S20	Construction & Materials-III	6	0	0	6
AA3010	Architectural Structures-III	2	1	0	2.5
AA3020	History of Architecture-I	2	1	0	2.5
AA3S30	Architectural Graphics	3	0	0	3
AA3030	Climatology	2	1	0	2.5
AA3110	Computer Application-II	0	0	3	1.5
AA3310	Value Added Programme	0	0	4	2
	Total				**29**

***L /S- Lecture/ Studio**

Year: 2nd **Semester: IV**

Course Code	Course Title	L / S	T	P	Credits
AA4S10	Architectural Design-IV	9	0	0	9
AA4S20	Construction & Materials-IV	6	0	0	6
AA4010	Architectural Structures-IV	2	1	0	2.5
AA4020	History of Architecture-II	2	1	0	2.5
AA4030	Environmental Services	2	1	0	2.5
AA4S30	Architectural Documentation	3	0	0	3
AA4110	Computer Application-III	0	0	3	1.5
AA4410	Educational Tour	0	0	2	1
	Total				**28**

***L /S- Lecture/ Studio**

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Year: 3rd **Semester: V**

Course Code	Course Title	L / S	T	P	Credits
AA5S10	Architectural Design-V	9	0	0	9
AA5S20	Construction & Materials-V	6	0	0	6
AA5010	Architectural Structures-V	2	1	0	2.5
AA5020	Contemporary Architecture	2	1	0	2.5
AA5030	History of Architecture-III	1	1	0	1.5
AA5S30	Building Bye Laws & Code of Practice	2	0	0	2
AA5S40	Working Drawing	5	0	0	5
AA5310	Value Added Programme	0	0	4	2
	Total				**30.5**

***L /S- Lecture/ Studio**

Year: 3rd **Semester: VI**

Course Code	Course Title	L / S	T	P	Credits
AA6S10	Architectural Design-VI	9	0	0	9
AA6S20	Construction & Materials-VI	6	0	0	6
AA6010	Architectural Structures-VI	2	0	0	2
AA6S30	Landscape Architecture	3	0	0	3
AA6020	Specification & Estimation	1	1	0	1.5
AA6S40	Interior & Retail Design	3	0	0	3
AA6030	Building Services	1	1	0	1.5
AA6310	Aptitude Building	0	0	2	1
	Total				**27**

***L /S- Lecture/ Studio**

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Year: 4th **Semester: VII**

Course Code	Course Title	L / S	T	P	Credits
AA7510	Practical Training	0	0	40	20
AA7520	Training Report Presentation	0	0	14	7
	Total				**27**

***L /S- Lecture/ Studio

Year: 4th **Semester: VIII**

Course Code	Course Title	L / S	T	P	Credits
AA8S10	Architectural Design-VIII	9	0	0	9
AA8S20	Construction & Materials-VIII	6	0	0	6
AA8010	Architectural Structures-VIII	2	1	0	2.5
AA8020	Building Economics	1	1	0	1.5
AA8030	Architecture Journalism	1	1	0	1.5
AA8S30	Town Planning	3	0	0	3
AA8210	Sustainable Buildings	1	0	2	2
AA8040	Environmental Studies	1	1	0	1.5
	Total				**27**

* L /S- Lecture/ Studio

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Year: 5th **Semester: IX**

Course Code	Course Title	L / S	T	P	Credits
AA9S10	Architectural Design-IX	9	0	0	9
AA9S20	Advanced Construction	4	0	0	4
AA9010	Professional Practice- I	2	1	0	2.5
AA9020	Research Skills & Project Introduction	2	1	0	2.5
AA9030	Construction & Resource Management	2	1	0	2.5
AA9210	Seminars	1	0	5	3.5
	ELECTIVE	0	0	2	1
AA9310	Value Added Programme	0	0	4	2
	Total				**27**

***** L /S- Lecture/ Studio

List of Electives for IX Semester

Subject Code	Subject Name
AA9610	Visual Arts & Communication
AA9620	Waste Management

Year: 5th **Semester: X**

Course Code	Course Title	L / S	T	P	Credits
AA0S10	Architectural Thesis	21	0	0	21
AA0010	Professional Practice- II	2	1	0	2.5
	Elective A**	1	0	2	2
	Elective B**	1	0	2	2
	Total				**27.5**

***** L /S- Lecture/ Studio

List of Electives for X Semester

Elective – A		Elective – B	
Subject Code	**Subject Name**	**Subject Code**	**Subject Name**
AA0610	Disaster Management	AA0640	Alternate Construction Technology
AA0620	Urban Design	AA0650	Advanced Building Services
AA0630	Earthquake Resistant Structures	AA0660	Advanced Structures

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Architectural Design–I**	Course Code: **AA1S11**
Credit: 6	L **6** T **0** P **0**
Year: **1st**	Semester: **I**

UNIT-I

Introduction to primary elements

A general survey of the changes in habitat in history. Architects' act, COA, IIA, NASA

UNIT-II

Introduction II

Art, Architecture & Architectural Design, Preliminary geometric interpretation from nature & surroundings

UNIT-III

Forms & Geometry

Transformations, Collisions, Articulation

UNIT-IV

Form & Space

Opening, Enclosures & Quality of Space, Organization of Form & Space, Types of Organization with emphasis on spatial relationship, Form of circulation space, path space relationship.

UNIT-V

Proportion & Scale

Material & Structural, Visual Scale & Human Scale

UNIT-VI

Ordering Principles

Geometrical, Structural, Dimensional, Material, Spatial through observation of surroundings as well as simple exercises in 2D and 3D.

Exercises in order and transformations of form and space.

Reference Books:

1. Charles Wallschlaeger&SynthiaBusic Snyder, *Basic Visual Concepts & Principles for artists, architects & des*igners, McGraw hill, USA, 1992
2. Paul Zelanski & Mary Pat Fisher, *Design principles & Problems*, 2nd Ed, Thomson & Wadsworth, USA,1996
3. Ching, F.D.K., "Design Drawing", Van Nostrand Reinhold

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Construction and Materials – I**	Course Code: **AA1S21**
Credit: 6	L **6** T **0** P **0**
Year: **2nd**	Semester: **I**

MATERIALS

UNIT I

Construction material from earth and industrial waste.

a) Blocking material
b) Binding material
c) Layering material

Supplemented with case studies of availability, strength, characteristics, appearance, usage, pricing and measuring units.

UNIT II

Classification, availability, characteristics and uses of natural Stone as a building material in elementary stone masonry

UNIT III

Types, properties and uses of cement

CONSTRUCTION

UNIT IV

- Vertical section of building explaining all the **building terminologies** with standard dimensions and specification.
- **Brick work** coarse work in substructure and super structure with details in English and Flemish bonds, walling joints and special bonds like Rat trap bond, Garden bond or decorative bonds.

UNIT V

Basic introduction about **substructure- Foundation** its need, basic design criteria in load bearing structure. Laying of Horizontal DPC (Using different material like Asphalt, Bitumen, Synthetic)

UNIT VI

- Stone work – Elementary stone masonry and types of joints and finishing.
- Arches in brick work.

Reference Books:

1. W. B Mckay, Building Construction
2. Harold B. Olin, Construction Principles Materials & Method
3. R.Chudley, Construction Technology

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Architectural Structures – I**	Course Code: **AA1011**
Credit: 2	L **2** T **0** P **0**
Year: **1st**	Semester: **I**

UNIT I

Simple Stresses & Strain

Introduction, types, elasticity, elastic theorem, limit, hook's law, modulas of elasticity, poison's ratio, linear strain, shear stress

UNIT II

Concept of Load

Introduction, static load, dynamic load or impact load, fluctuating load, stresses created by these loads

UNIT III

Properties of Sections

C.G., M.I., section modulas, radius of gyration, theorem of perpendicular & parallel axis, M.I. for composite sections

UNIT IV

System of Forces

Types, law of parallelogram, law of triangular of forces resolution, resultant, equilibrium condition, moments, couples

UNIT V

Shear Force & B.M.

Introduction to different beams (cantilever, simple supported, fixed, continuous) concept, of shear force & bending moment, sagging & hogging moments, B.M. & shear force diagrams for determinate beams under simple loads, moment of resistance, point of contraflexure, interrelation between B.M. & S.F. diagram

UNIT VI

Theory of Columns

Introduction, Euler's load, derivation of Euler's formulae, buckling, short & long columns, slenderness ratio, Rankin's formulae, effects of eccentric loading

UNIT VII

Stresses in Beams

Introduction to beam, theory of simple bending, neutral axis, bending & shear stress in symmetrical sections, bending & shear stress distribution & its diagram.

Reference Books:

1. Strength of Materials by J.P. Den Hartog
2. Engineering Mechanics for Structures by Louis L. Bucciarelli

Faculty of Architecture
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Batch: 2016-21

Course Title: **Architectural Drawing – I**	Course Code: **AA1S31**
Credit: 6	L **6** T **0** P **0**
Year: **1st**	Semester: **I**

UNIT I

Drawing Tools and Accessories

Introduction to the subject and drawing equipment. Setting of drawing equipment.

UNIT II

Lettering & Scale

- Free hand and mechanical lettering.
- Types and uses of scales, Scales used by an architect, Reducing and enlarging scales

UNIT III

Basic Technical Drawing

- Types of line, Drafting and quality of lines with pencil and ink pen
- Division of lines and angles.
- Drawing polygons, Inscribing and circumscribing circles in polygons. Internal & External tangents, Metric Drawing

UNIT IV

Orthographic Projections

- Definition, Planes of Projections, Types of angle projections :- First angle projections & Third angle projection,
- Projection of regular rectilinear and circular solids (prisms, pyramids, cones, cylinders, spheres etc.) in different positions,
- Surface Development of solids, interpenetration of solids

Reference Books:

1. Engineering Drawing and Design by David A. Madsen
2. Architectural Drawing Course by Zell, Mo
3. Ching, F.D.K., "Design Drawing", Van Nostrand Reinhold

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Art and Graphics – I**	Course Code: **AA1S41**
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: **I**

UNIT I: Philosophy of Art
Relevance of art of life : Art and artist, Art and society, Art and religion, Art and mysticism.
Art in architecture : psychological and emotional aspect of aesthetics

UNIT II: Theory of Design (Introduction to Graphic Composition)

- Early Christian, Byzantine , Roman, Gothic Art
- Rennaissance – Giotto, Leonardo da Vinci, Michael Angelo.
- Baroque – Rembrandt.
- Realism – Rodin,, Ingres.
- Impressionism – Manet, Renoir, Gauguin, Van Gogh.
- Fauvism – Matisse.
- Cubism – Picasso, Henry Moore, Duchamp.
- Expressionism – Paul Klee, Chagall.
- Surrealism – Dali.

UNIT III: Art and Graphic Skills

- Free hand drawing – drawing people, furniture, fabric and transport from imitation, observation and recapitulation.
- Rendering techniques – for textures of materials and finishes ; using equipments like transfers, airbrush, rendering architectural drawings
- Still life drawing – from observation.
- Drawing from nature-shrubs, trees, grass, plats, flowers, rocks, water.

Reference Books:
1. H. Gardner, Art Through Ages
2. R.W. Gill, Rendering With Pen & Ink
3. K. Kingsley, Free Hand Sketching in Architectural Environment

Course Title: **Workshop / Model Making**	Course Code: **AA1110**
Credit: 0.5	L: **0** T: **0** P: **1**
Year: **1st**	Semester: **I**

UNIT I: Workshop

- Making different bonds & wall junctions in brick masonry
- Introduction to carpentry tools, Making carpentry joints

UNIT II: Model Making
Making three dimension models of different architectural forms using various materials

UNIT III: Photography
Creative composition in photography and its role in documentation and creative design process

Reference Book:
1. S.K. Yadav, Workshop Practice

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Professional Communication – I**	Course Code: **HA1210**
Credit: 2.5	L **2** T **0** P **1**
Year: **1st**	Semester: **I**

UNIT – I

Communication

1. Communication: Definition and Process of Communication.
2. Types of Communication: Formal & Informal Communication, Verbal & Non-Verbal Communication.
3. Barriers to Communication: Intrapersonal and Interpersonal Barriers. Semantic Barriers, Physical Barriers, Psychological Barriers, and Organizational Barriers.

UNIT – II

Listening and Speaking Skills

1. Importance and Objective of Listening Skills, Process of Listening, Listening and Hearing, Types of Listening, and Methods for Improving Listening Skills.
2. Listening Comprehension: Identifying General and Specific Information.
3. Listening for Note taking and drawing Inferences.
4. Importance of Speaking Skills, Types of Speaking, Methods for Improving Speaking Skills
5. Introduction to Phonetic Transcription: Familiarization with British and American Usage

UNIT – III

Reading Skills:

1. Importance of Reading Skills, Types of Reading Skills, Methods of Improving Reading Skills.
2. Vocabulary Building: Antonyms, Synonyms, Homophones, Homonyms, and One-Word Substitution, Etymology and roots.

UNIT – IV

Writing Skills

1. Importance of Writing Skills, Types of Writing Skills, and Methods for Improving Writing Skills.
2. Sentence and Paragraph Construction. Writing Expository, Argumentative, and Deductive Order etc Paragraphs.
3. Précis Writing
4. Basic Letter Writing: Format and Style of Formal Letters.

UNIT – V

One Act Play

Practice of LRSW through the study of the one act play, ***THE REFUND*** by **Fritz Karinthy**.

Text Books:

1. Gupta, Ruby. Basic Technical Communication, Cambridge University Press, New Delhi.2012.

Reference Books:

1. Rizvi, Ashraf. Effective Technical Communication, McGraw Hill, New Delhi. 2005
2. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011
3. Tyagi, Kavita& Padma Misra. Basic Technical Communication, PHI, New Delhi. 2011
4. Lewis, Norman. Word Power Made Easy, W.R Goyal Pub. & Distributors.1995
5. Ford A, Ruther. Basic Communication Skills; Pearson Education, New Delhi.2013
6. Aslam, Mohammad. Introduction of English Phonetics and Phonology Cambridge.2003
7. Kameswari, Y. Successful Career Soft Skills and Business English, BS Publications, Hyderabad. 2010
8. English Pronouncing Dictionary, Cambridge.2012
9. The Oxford Guide to Writing and Speaking. OUP, Delhi.2011

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Course Title: **Soft Skills – I**	Course Code: **HA1030**
Credit: 1	L **0** T **0** P **2**
Year: **1st**	Semester: **I**

Soft Skills Development Program

…Shape-up your soft skills, your power to success

Soft skills are essential to successful employment. This program cover enhancement of the emotional, mental and physical state of individuals. It covers different issues such as increasing and sustaining accurate attitudes, sustaining self-hope and setting of the right kind of goals, developing winning relationships and building a healthy self-image. Lesson plans and practical exercises address issues of responsibility, adaptability and teamwork. This program is a perfect blend of complete behavioral and Verbal skills which makes one job ready and transforms them into industry ready resources keeping in mind the future challenges and need of the industry.

Performance Focus

First, this program helps learners identify and sharpen their unique skills. Second, the program facilitates the learners to learn, practice, develop and apply these key skills to their maximum benefit to excel in their profession and better their personal life.

Basic Outline of the Course

1. Get the Basics Right
a) Pre-Assessment
What does an employer expect from us?
What is our expectation from an employer?
b) Who Am I? (Psychometric approach)
Recognizing Self
What after B. Tech/ B. Arch/ B, Pharma
What options do I have
Mastering own destiny

2. Goal Setting
What is a Goal
Importance of goal setting
Setting professional and personal goals
Importance of SMART-er Goals
Concept of GITA
Personal action plan

3. Time Management
Why time management
Dimensions of time
Time Matrix and 80: 20 Principal
Time Wasters and how to deal with these
Planning and organizing
Things to do

4. SWOT Analysis
What is SWOT Analysis
Importance of SWOT analysis
How you use SWOT for your growth

5. Confidence Building / Self-Motivation
Importance of Self Confidence & Self-Motivation
Positive attitude and its magical impact
How to be self-confident
How to remain self-motivated
Creating positive environment

6. Positive Attitude
What is positive Attitude?
Why is it important?
How can attitude become a deciding factor for your success or failure?

7. Perception
What is perception?
Factors influencing perception
How to improve perception
Its application in organization

8. Reading Skill
What is effective reading skill
How to develop an effective reading skill
Pronunciation
Voice modulation, word stress
Sounds letter relationship
Word recognition skill
How does it help you become an effective speaker

9. Body Language
What is body language
How important is your body language for your success
How to develop a positive & impressive body language
Key aspects of proper body language
Handshake, Eye Contact
Smile and your facial expression
Sitting / Standing postures
Body Postures
Body Gestures
Head position and head movement

11. Group Discussion
What is GD and what is debate
Why GD
Roles played in a GD
Mock GD

12. Personal Grooming
What is grooming?
How crucial is it for you to make a statement?
How to groom self for the right occasion?
Do's and don'ts

13. Decision Making Ability
What is decision making ability

How critical is it for your success in life
What is Smart Decision
Decision Making Process
6 thinking hats
Self Discipline and Self Control
Personal check

14. Team Building and Team Management

What is a Team?
What is the difference between Team and Group?
The characteristics of team
Factors to be considered to build an effective team
How to build a Team
Understanding the team dynamics
Addressing issues amicably, Prevention of conflicts

15. Leadership Skill

Who is a Leader?
Characteristics of a true Leader
Leader's Role; Leading self and others

16. Post Assessment

Quiz on Time management
Quiz on Body language
Quiz on memory skill and thinking Skill
Case study on Decision making ability
Exercise on team building and leadership
Extempore and group discussion test

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Architectural Design–II**	Course Code: **AA2S11**
Credit: 6	L **6** T **0** P **0**
Year: **1st**	Semester: **II**

UNIT I

Graphical representation : Graphical representation of building components- structural & spatial.

UNIT II

Measured drawing : Measured drawing of building unit or units representing the structural & spatial components.

UNIT III

Anthropometrics Studies : Graphical analysis of human dimensions & functions with respect to the measured drawing exercises

UNIT IV

Building design : Design of a habitable unit conforming to human dimensions is to space relationship & space is to space relationship.

UNIT V

Testifying : The design principles through academic exercise.

Reference Books:

1. Mike W. Lin, Drawing & Designing With Confidence
2. DeChiara & Callender, Time Saver Standards for Building Type
3. The Measure of Man and Woman: Human Factors in Design by Alvin R. Tilley and Henry Dreyfuss Associates

Faculty of Architecture
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Batch: 2016-21

Course Title: **Construction and Materials – II**	Course Code: **AA2S21**
Credit: 6	L **6** T **0** P **0**
Year: **1st**	Semester: **II**

MATERIALS

UNIT I

Cement &Lime: Basic definitions, types, classification, properties and uses of various types of cement & limes

UNIT II

Sand: sources of sand, classification of sand, bulking of sand, test for sand, properties of sand and substitute of sand.

UNIT III

Mortar: Classification of mortar, various types of mortar (lime, surkhi, cement and gauged) uses of mortar, properties of good mortar, preparation of mortar, selection of mortar

UNIT IV

Timber : Softwood and Hardwood - Secondary Timber - Physical properties and their uses/ applications in buildings (framing, shutters, Panelling, flooring, roof finishing and furniture) - Defects, Conversion, Seasoning, Decay and preservation of timber - Fire retardant treatment, anti-termite treatment.

Industrial Timber - plywood, block board, particle board, fibre boards. MDF boards, veneers, laminates etc and other current products/development.

CONSTRUCTION

UNIT V

TIMBER:

- Elementary carpentry, Tools, Common joints,
- Types of Doors-Ledged, Braced Batten Door, Panelled, Flush, Carved, Sliding doors, Sliding and folding doors, Mosquito Proof Shutters.
- Types of windows, ventilators and their details.
- Mouldings, margins etc in wood and substitute materials.
- Wooden Partitions and panelling

Reference Books:

1. W. B Mckay, Building Construction
2. Building Construction Illustratedby Francis D. K. Ching
3. Fundamentals of Building Construction: Materials and Methods by Edward Allen & Joseph Iano

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Architectural Structures – II**	Course Code: **AA2011**
Credit: 2	L **2** T **0** P **0**
Year: **1st**	Semester: **II**

UNIT I

Properties & Behavior of Structural Materials: Concept of homogenous & heterogeneous materials in response of direct & bending force

UNIT II

Direct & Bending Stress: Introduction, stress distribution for eccentrically loaded section- rectangular, solid circular, hollow circular

.

UNIT III

Slope & Deflection of Beams: Slope deflection method, moment distribution method, conjugate beam method, Macaulay's method for simple supported & cantilever beams, slope & deflection of fixed & continuous beams

UNIT IV

Analysis of Indeterminate Structure: Introduction, continuous, fixed, cantilever beams, free end moments, analysis, reaction at supports, effects of sinking, advantages & disadvantages of continuous, fixed & cantilever beams

UNIT V

Analysis of Determinate Structure: Introduction, perfect frame, deficient frame, redundant structure, reaction at supports, analysis of simple supported & cantilevered trusses (method of joints, method of section)

Reference Books:

1. Building Structures Illustrated by Francis D. K. Ching
2. Strength of Materials by J.P. Den Hartog
3. Engineering Mechanics for Structures by Louis L. Bucciarelli

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Architectural Drawing – II**	Course Code: **AA2S31**
Credit: 5	L **5** T **0** P **0**
Year: **1st**	Semester: **II**

UNIT – 1

Section of Solids: Sections of regular rectilinear and circular solids (prisms, pyramids, cones, cylinders, spheres etc.) in varying conditions of sectional plane and true shape of sections

UNIT – 2

View: Isometric, axonometric and pictorial view

UNIT – 3

Perspective Drawing: Purpose and use. Differences with metric projections.

UNIT – 4

Anatomy of A Perspective: cone of vision, station point, picture plane, eye level, horizon line, ground line, vanishing point, etc.

UNIT – 5

Types of Perspective: One point, two point, three point perspectives

UNIT – 6

Perspective Drafting: Perspective of - simple and complex box blocks, simple curved surface, simple household furniture items & simple & medium sized buildings- isolated or in-group

UNIT – 7

Shortcut Methods:

Introduction to short cut methods in perspective drawing. Free hand perspective

Reference Books:

1. M.G. Shah & K.M. Kale, Perspective Principles
2. Shankar Mulik, Perspective & Sciography
3. Architectural Sketching and Rendering: Techniques for Designers and Artists by Stephen Kliment

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Arts and Graphics – II**	Course Code: **AA2S41**
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: **II**

UNIT – I

PHILOSOPHY OF ART

- Outline History of Indian Art from earliest times to the renaissance of Indian Art in late 19th century.
- Contemporary arts in India and the works of Abhinendra Nath Tagore, Nand Lal Bose, Jamini Roy, Amrita Sher Gill, M.F. Hussain, Satish Gujral and S.H.Raza
- Western Art From prehistoric To Medieval art (stone age, Beginning of Art, Art Of-Egypt, Greece, Etruscan, Roman, Early Christian , Byzantine & Gothic Art)
- Works of masters of Modern Architecture Rennaissance – Giotto, Leonardo da Vinci, Michael Angelo

UNIT – II

RENDERING

- Rendering in different media.
- Rendering of students own works (design project) interior and exterior perspectives.
- Enlargement and Rendering in Ink the India Decorative motifs..

Reference Books:

1. H. Gardner, Art Through Ages
2. R.W. Gill, Rendering With Pen & Ink
3. K. Kingsley, Free Hand Sketching in Architectural Environment
4. Architectural Sketching and Rendering: Techniques for Designers and Artists by Stephen Kliment

Course Title: **Surveying and Leveling**	Course Code: **AA2110**
Credit: 1	L: **0** T: **0** P: **2**
Year: **1st**	Semester: **II**

UNIT -I

Surveying

- Role of surveying in Architecture, Types of survey.
- Introduction to various techniques – Chain and Plain Table Survey, Travers Survey.
- Contouring – Contour Maps, characteristics, use and interpretation.

UNIT –II

Leveling

General principles and application of application of Levelling in Surveying

Reference Books:

1. Kevin Lynch, Site Planning

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Computer Application – I**	Course Code: **AA2120**
Credit: 1	L **0** T **0** P **2**
Year: **1st**	Semester: **II**

UNIT – 1

BASICS
Computer Basics, Introduction to Internet

UNIT – 2

MS OFFICE
Working on Word, Excel & PowerPoint

UNIT – 3

PHOTO EDITING & DTP SOFTWARES
Photo Shop, Photo Editor, Coral Draw, PageMaker

UNIT – 4

INTRODUCING AUTOCAD
creating floor patterns, drawing simple objects like door, window, stairs etc

Reference Books:
1. Autocad 2014 by Ellen Finkelstein.
2. Microsoft Office Professional 2013 Plain & Simple by Murray, Katherine

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Professional Communication – II**	Course Code: **HA2230**
Credit: 2.5	L **2** T **0** P **1**
Year: **1st**	Semester: **II**

UNIT I

PROFESSIONAL COMMUNICATION

1. Importance and Features of Business Communication, Flow and Channels of Communication in an Organization.
2. Introduction to Technical Communication, Types and History of Technical Communication.
3. Difference between General and Technical Communication, Importance of Technical Communication.
4. Characteristic of Technical Communication, and Elements of Style.
5. Process of Preparing a Technical Document.
6. Elements and Features of Scientific Articles.
7. Compunication, E- mail, E- tools and Encyclopedia.

UNIT II

BUSINESS CORRESPONDENCE

1. Business Correspondence – Principles, Features, Types, Format and Layout of Business Letter.
2. Inter Office Correspondence – Letters of Enquiry, Quotation, Order, Sales, and Complaint.
3. Intra Office Correspondence: Notice, Agenda, Minutes, and Memorandum.
4. Job Application Letter.

UNIT III

TECHNICAL PROPOSAL and TECHNICAL REPORT

1. Technical Proposal - Introduction, Purpose, Features, Types, Format, Importance, and Writing Technical Proposals and Plagiarism.
2. Technical Report - Features, Types, Style, Format, Relevance, and Writing Technical Reports.

UNIT IV

CORPORATE COMMUNICATION SKILLS

1. Dimensions and importance of EQ
2. Interpersonal communication skills - Life Position, and Transactional Analysis
3. Johari Window: Role of Feedback and Disclosure in Communication; Accepting Criticism
4. Cross Cultural Communication
5. Attitude
6. Perception
7. Personality Attributes and Communication: Self Esteem, Self-Monitoring, Impression Management, and Locus of Control.
8. Conflict and Negotiation

UNIT V

PROJECT

REPORT WRITING/ PROPOSAL WRITING

The students will write a Report **OR** a Proposal consisting of 10-15 pages.

REPORT WRITING

1. For B.Tech. students-

Technical Report describing new machinery, a report on the sudden break down in production unit, and market survey report for formulating new market strategy.

2. For B.Pharm. students

Technical Report based on the site inspection of a drug manufacturing unit, Survey Report on Health Awareness and Self-Medication.

3. For B.Arch. students

Technical Reports based on a Site Inspection for Geographical and Geological aspects of a particular location, A Report on the Architectural Survey of a Monument. Architectural

PROPOSAL WRITING

1. For B.Tech. students

Technical Proposal to organize a Technical Training Program, To develop new range of a product and to start a new venture.

2. For B.Pharma. students

Technical proposal to establish a new laboratory, To create new drug-composition and to visit to a Super Specialty Hospital.

3. For B.Arch. students

Technical Proposal for an Archeological Site visit , To Construct New Buildings.

Report Writing and Proposal Writing carries 30 marks equivalent to three class tests.

Reference Books:

1. Gupta, Ruby. Advanced Technical Communication, Cambridge University Press, New Delhi, 2011

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Architectural Design – III**	Course Code: **AA3S10**
Credit: 9	L **9** T **0** P **0**
Year: **2nd**	Semester: **III**

UNIT I

ARCHITECTURE AS A DESIGN RESPONSE TO THE PHYSICAL ATTRIBUTES OF A SITE
Location, access, topography, surroundings and site elements such as trees, rock, views etc. – Design programs for small **residential buildings**, and similar proto types can be explored – Study of the architectural style of aneminent architect & the generation of design proposals using the same - Ex. Weekend cottage on a Beach /Hill/Farm/Forest etc or a Workspace (Office/Studio/clinic) cum residence

UNIT II

ABSTRACTING NATURAL FORMS TO GENERATE DESIGN FOR A SMALL STRUCTURE
The Design approach of copying or abstracting patterns and **forms existing in nature** can be encouraged - Ex.Milk parlor / snack kiosk / Garden pavilion / Entrance portal with a security booth / Bus stop with toilet andpetty shop etc.

Reference Books:

1. Bousmaha Baiche & Nicholas Walliman, Newfert Architect's Data
2. DeChiara & Callender, Time Saver Standards for Building Type
3. House Design by BERKUS
4. Houses: Designing The Public Private Houses by BARBER

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Construction and Materials – III**	Course Code: **AA3S20**
Credit: 6	L **6** T **0** P **0**
Year: **2nd**	Semester: **III**

MATERIALS

UNIT I

Surface Finishing; Types of plastering, types of jointing and pointing. Cladding with natural and artificial stones, their composition, sizes, colours, properties, defects and their fixing details

Paints: characteristic of an ideal paint, types of paints, defects in painting, painting on different surfaces.

Varnishing: characteristics of an ideal, varnish types of varnishes, process of varnishing**.**

Distemper: properties of distempers, process of distempers. Wall finishes: wall paper, whitewashing and colour washing for walls.

UNIT II

Glass and Fiber Glass

Glass: - Classification of glass, types of glass, physical properties and uses of glass, special varieties of glass and Architectural glass.

UNIT III

ROOF COVERINGS: Clay Tiles (Country, Allahabad, Mangalore tiles etc.).
Concrete Tiles, Asbestos Cement sheets (Plain & Corrugated),
Aluminium Sheets (Plain & Corrugated).
Galvanised Iron Sheets (Plain & Corrugated), Stone, Slating, Shingles, Thatch. Any contemporary roofing material.

CONSTRUCTION

UNIT IV

ROOFING SYSTEMS IN TIMBER

UNIT V

Temporary Timbering
Timbering to shallow trenches Raking, Flying Needle shoring.

Formwork
Centring and shuttering in different material used in building industry (conventional and contemporary).

UNIT VI

Vertical Transportation
Brief introduction to stairs, lifts, escalators & conveyor belts

Reference Books:

1. W. B Mckay, Building Construction
2. Building Construction Illustrated by F.D.K. Ching
3. R.Chudley, Construction Technology
4. Building Construction by Verghese

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Architectural Structures-III**	Course Code: **AA3010**
Credit: 2.5	L **2** T **1** P **0**
Year: **2nd**	Semester: **IV**

UNIT -I

Plain Cement Concrete

Introduction to cement, types of cement, aggregates, ingredients of plain cement concrete, grades of concrete, water cement ratio, properties of P.C.C, concrete mix

UNIT –II

Reinforced Cement Concrete

Introduction & properties of concrete and test, reinforcing steels. requirements of governing & detailing, IS code 456-2000

UNIT-III

Design Method

Working and Limit State Design of reinforced concrete sections for bending and shear; Bond strength and development length; Serviceability; Limit states of deflection and cracking

UNIT-IV

Design of Beams

Theory & Design Of Single & Doubly Reinforced Beams, L& T Beams (Simple Supported, cantilever & Continuous), Concept Of Over Reinforced & Under Reinforced Sections and balance section

UNIT –V

Design of Slab Lintel, Sunshade

Classification, Load Estimation, Design Of One Way slab, Two Way slab, Flat slab, Continuous Slab and cantilever slab.

The application of all of the above designing methods should be studied by designing a small module of area not less than 25 sq.m (e.g. 3x4, 4x4 etc.)

Text books:

1. Design of Reinforced Concrete, 8th Edition; by McCormac, Jack C.
2. Reinforced Concrete Design (7th Edition); by George F. Limbrunner and Abi O. Aghayere
3. Design of Concrete Structuresby Nilson, Arthur H

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **History of Architecture – I**	Course Code: **AA3020**
Credit: 2.5	L **2** T **1** P **0**
Year: **2nd**	Semester: **III**

INDIAN CONTEXT

UNIT I

- **Indus Valley civilization:** Particularly in reference to the town planning principles exemplified with examples from Mohenjodaro and Harappa
- **The Aryan civilization:** With its emphasis on the Vedic town plan, its motifs and patterns
- **Buddhist Architecture:** In specific reference to the lats, eddicts, stupas, viharas and chaityas. Both in rock-cut or otherwise

UNIT II

- **Hindu Architecture-Indo Aryan:** With special attention to the evolution of the temple form, the shikhara in north India. Reference also to be made to the three schools of Architecture-the Gujrat, the Khajuraho, and the Orrisan styles
- **Hindu Architecture-Dravidian:** Particularly in reference to the evolution of the vimana and the contributions of the Chalukyas, the Pallavas, the Pandyas and Cholas as well as the contributions of the Nayaks to the temple cities.

UNIT III

Jain Architecture: With specific reference to the temple cities of Palitana and Cemar

Reference Books:

1. Sir Banister Fletcher, A History of Architecture
2. Percy Brown, Indian Architecture (Buddhist & Hindu Period)
3. Percy Brown, Indian Architecture (Islamic Period)
4. Islamic Architecture: Form, Function & Meaning by Hillenbra

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Architectural Graphics**	Course Code: **AA3S30**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III**

UNIT I

Graphical Representation of Following in Floor Plans, Section and Elevation of a Building

Beams, columns, arches & slab, lintels
Balcony and other projections
Mezzanine floor & loft
Stairs, balustrade, railing, ramps
Door, window, ventilator
Rivets, welding, bolting
Steel structural members
Complex structures- dome, waffle slab, shell, tensile membrane structures etc

UNIT II

Shades & Sciography

Values in shades & shadows
Shades & shadows of objects & building elements cast on irregular surfaces
Rendering in different mediums
Shortcut methods for constructing shadows
Shades & shadows in perspective views for exterior & interior
Shades & shadows cast by point source of light in interiors.

UNIT III

Presentation Techniques

Presentation drawings of small buildings through plans, elevations, site plan etc. Using various rendering techniques and media and incorporating graphical representation of structural elements

Reference Books:

1. R.W. Gill, "Rendering with Pen & Ink"
2. Architectural Graphics by Francis D. K. Ching

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Climatology**	Course Code: **AA3030**
Credit: 2.5	L T P **2 1 0**
Year: **2nd**	Semester: **III**

UNIT I

INTRODUCTION

Global Climate Factors, Elements Of Climate, Site Climate

UNIT II

COMFORT CONDITIONS

Thermal Comfort Factors, Thermal Comfort Indices, Effect Temperature & Its Use.

UNIT III

PRINCIPLES OF THERMAL DESIGN

Thermal Quantities, Heat Exchange Of Buildings, Periodic Heat Flow

UNIT IV

MEANS OF THERMAL CONTROL

Structural Controls, Ventilation & Air Movements

UNIT V

DAY LIGHTING

Principles & Prediction Techniques

UNIT VI

DESIGN APPLICATION

Shelter For Composite Climates, Shelter For Warm Humid Climates, Shelter For Hot Dry Climates, Shelter For Tropical Upland Climates

Reference Books:

1. O.H. Koenigsberger, Manual of Tropical Housing & Building
2. M. Evans, Housing, Climate & Comfort
3. Donald Watson & Kenneth Labs, Climatic Design
4. Building for a Changing Climate by Peter S. SMI

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Computer Application – II**	Course Code: **AA3110**
Credit: 1.5	L **0** T **0** P **3**
Year: **2nd**	Semester: **III**

UNIT I

AUTOCAD 2D

- drawing plan, elevation, section etc
- using all the 2D commands

UNIT II

3 D DRAFTING ANATOMY OF A PERSPECTIVE

introduction to 3D commands of AutoCAD and concept of ucs, viewport etc

Reference Books:

1. Autocad 2014 by Ellen Finkelstein.

Course Title: **Value Added Programme**	Course Code: **AA3310**
Credit: 2	L **0** T **0** P **4**
Year: **2nd**	Semester: **III**

There will be a workshop on Google Sketchup

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Architectural Design – IV**	Course Code: **AA4S10**
Credit: 9	L **9** T **0** P **0**
Year: **2nd**	Semester: **IV**

UNIT I

Bio-climatic design approach to the planning and design of buildings having an agglomeration ofsimple spaces with particular emphasis on the design of the building envelope i.e articulation ofopenings, choice of materials for roof & walls of different orientations etc – Integration of passive,active & hybrid solar technologies with the design proposals are encouraged – Ex. Youth hostel /Nursing home / old age home / charity homes etc**.**

UNIT II

Exploration of light quality in spaces for study and interaction – Study of the intensity & quality ofnatural light under various circumstances and its transformation in interiors due to location, size andmaterial of glazed openings – Use of high openings, clear-storey's, dormer windows, light wells,courtyards and other contraptions to bring light into the interior of buildings –To analyze how spacessuch as corridors, lobbies, courtyards etc can be designed to foster interaction – Ex. Nursery & Primaryschool / Library / Students center / Cafeteria**.**

Reference Books:

1. BousmahaBaiche& Nicholas Walliman, Newfert Architect's Data
2. DeChiara&Callender, Time Saver Standards for Building Type
3. O.H. Koenigsberger, Manual of Tropical Housing & Building
4. M. Evans, Housing, Climate & Comfort
5. Donald Watson & Kenneth Labs, Climatic Design
6. Building for a Changing Climate by Peter S. SMI

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Construction and Material – IV**	Course Code: **AA4S20**
Credit: 6	L **6** T **0** P **0**
Year: **2nd**	Semester: **IV**

MATERIALS

UNIT I

Concrete: Ingredients - suitability requirements' for aggregates, grading of aggregates - role of water in concrete -reinforcement - admixtures - properties of concrete. Manufacture of concrete and concreting – mix proportioning - batching, mixing, transporting, placing, compaction, curing formwork - quality control -

outline of tests for concrete -

Concreting: effect of form work in terms of finishing of concreting, mixing, transporting and placing, consolidating and curing of concrete.various types of cement concrete., the properties and uses.

UNIT II

Special Concrete and Concreting Methods

Lightweight, high-density, fibre reinforced, polymer concrete - outline of manufacture, properties and uses of the above - ready mixed concrete - guniting - cold weather and underwater concreting – current developments in concrete products and methods of concreting.

CONCRETE CONSTRUCTION

UNIT III

Introduction to RCC framed structures concrete in foundation:

Footing Foundations – types and construction details.

Shallow Foundations: All types and details with special reference to Rafts – situations where adopted, raft with basement, water proofing of basements below ground water table.

Deep Foundations : Pile foundations – situations where adopted, types of piles, methods of construction, pile capacity from pile loading tests, under reamed piles.

Concrete slabs: one-way two way continuous & cantilever.

Concrete beams: singly reinforced, doubly reinforced, cantilever & continuous beams. Concrete columns, floors, walls, partitions, lintels, arches, sunshades**.**

UNIT IV

RCC Staircases: Types according to profile – straight flight, doglegged, quarter turn half turn, bifurcated, spiral & Helical. Structural system for the above types sloped slab, cranked slab, cantilevered slab, continuous slab& folded plate, foundation for RCC stair case. Vertical transportation.

UNIT V

DIFFERENT TYPES OF JOINTS IN CONCRETE

Reference Books:

1. Building Construction Illustratedby Francis D. K. Ching
2. Exercises in Building Construction by Edward Allen
3. Soil Mechanics & Foundations by Budhu, Muni
4. Soils & Foundations by Cheng Liu & Jack Evett

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Architectural Structures – IV**	Course Code: **AA4010**
Credit: 2.5	L **2** T **1** P **0**
Year: **2nd**	Semester: **IV**

UNIT – 1

DESIGN OF R.C.C. COLUMN

Design of rectangular column.
Design of circular column.
Design of square column

UNIT – 2

DESIGN OF STAIRS

Effective Span, Load Distribution On Stairs, Design (Simple Problems)of dog legged, tread-riser, type stair

UNIT – 3

SHEAR WALL

Introduction & design procedure of shear wall

UNIT – 4

PRESTRESSED CONCRETE

Introduction, different method of pre-stressed concrete, losses of pre-stressed concrete, advantages and disadvantages

UNIT – 5

DESIGN OF LOAD BEARING STRUCTURE

Design of brick wall foundation and isolated footing for brick column
Design of brick masonry wall
Design of brick masonry column
Design of openings in brick wall (e.g. arch etc.)
Design of roofing structure in brick masonry (e.g. vault, dome etc.)

The application of all of the above designing methods should be studied by designing a small module of area not less than 100 sq.m (e.g. 3x4, 4x4 etc.) with objectivity of learning to design basement.

Reference Books:

- Design of Reinforced Concrete, 8th Editionby McCormac, Jack C.
- Reinforced Concrete Design (7th Edition)by George F. Limbrunner and Abi O. Aghayere
- Design of Concrete Structuresby Nilson, Arthur H

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **History of Architecture – II**	Course Code: **AA4020**
Credit: 2.5	L **2** T **1** P **0**
Year: **2nd**	Semester: **IV**

PRIMITIVE BEGINNING

UNIT I

- Introduction to history and architecture with special emphasis on Stone Age to Neolithic settlement in Europe and around with examples from Carnac and Stonehenge
- **Birth of Civilization:** In reference to the Asia-minor region with nascent cities like Jericho, Catalhoyuk and Hattasusetc

ISLAMIC CONTEXT

UNIT II

- Introduction and understanding of Islam's philosophy and its interpretation in building type e.g. mosque. tomb. Fort and their elements like domes, minarets, arch. Squinchetc
- **Sultanate Style**- With reference to the slave, khalji, tughlaq, sayyid, lodhis and shershansuri regimes who ruled from Delhi) and their architecture
- **Provincial Style**- Development of colloquial styles in various provinces of India like Punjab, jaunpur, Gujarat, Bengal, Bijapur, Bihar and Deccan

UNIT III

- **Mughal Architecture**- The architecture of the Timurids in India- Babur, Hamayun, Akhbar, Jahangir and Shahjahan.
- **Later Mughal**- The Oudh architecture in Lucknow and its surroundings briefly outlining the Lucknow city

UNIT IV

Colonial- The British architecture of the colonial days in India the capitol at delhi and the residency at Lucknow emphasizing on their planning criteria and architectural features

Reference Books:

1. Sir Banister Fletcher, A History of Architecture
2. Percy Brown, Indian Architecture (Buddhist & Hindu Period)
3. Percy Brown, Indian Architecture (Islamic Period)
4. Islamic Architecture: Form, Function & Meaning by Hillenbra

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Environmental Services**	Course Code: **AA4030**
Credit: 2.5	L **2** T **1** P **0**
Year: **2nd**	Semester: **IV**

UNIT I

WATER SUPPLY

1. Need to protect water supply and requirements of water supply to different types of buildings.
2. Sources of water supply. Quantity and quality of water and treatment of plants.
3. Conveyance of distribution of water overhead tank underground tanks pipe appurtenances.
4. Hot and cold water supply system in a low rise and high rise buildings. Distribution system in campus. Pipes their sizes. Jointing and different fittings

UNIT II

SANITARY ENGINEERING

1. Purpose and principles of sanitation. Collection and conveyance of waste water.
2. Quantity and quality of refuse. Design and construction of sewer's and sewer appurtenances.
3. Roof and surface water drainage.
4. Sanitary appliances. Traps their variety. Pipes and joints. Sanitary pipes works below and above ground level. Drainage in non-municipal area.
5. Rain waters storage and water harvesting principles and methods

UNIT III

SYSTEM OF PLUMBING AND PLUMBING BYE-LAWS

1. The water supply and sanitary system individual and group of buildings.
2. Indian standards for designing the toilet, kitchen.
3. Plumbing by-laws

Reference Books:

1. Plumbing, Electricity, Acoustics by Norbert M. Lechner
2. Water Distribution System Handbookby Mays, Larry
3. Plumbing: Cold Water Supplies, Drainage and Sanitationby F. Hall
4. The Sanitation of Water Suppliesby Murray P. Horwood

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Architectural Documentation**	Course Code: **AA4S30**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **IV**

UNIT I

PURPOSE OF DOCUMENTATION

To record existing structure, to aim at conservation of structures etc.

UNIT II

SELECTION OF THE PROJECT

Heritage Documentation, Monograph of an architect, Contemporary project etc.

UNIT III

RESEARCH

Historical research related to styles & contemporary works, influence of culture & technology, context, its role etc.

UNIT IV

GEODETIC SURVEY

Topographic maps, road maps, site maps etc., Architectural survey, survey methodology, physical measure drawings, photographic survey, digital architectural photogrammetry (2D-3D digital drawings) etc.

UNIT V

FINAL PRESENTATION

Document of a small architectural example or a part of the structure, where the content will cover various issues mentioned above.

Reference Books:

1. Previous documentations done by the students for NASA trophy
2. The little book of documentation by Anita Cheria-Edwin
3. Building the architecture documentation by Safari books online.

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Computer Application–III**	Course Code: **AA4110**
Credit: 1.5	L T P **0 0 3**
Year: **2nd**	Semester: **IV**

UNIT I

AUTOCAD 3D

- drawing 3D views
- using all the 3D commands

Reference Books:

1. Autocad 2013 by Ellen Finkelstein.
2. Mastering Autodesk Revit Architecture 2013 by Phil Read, James Vandezande& Eddy Krygiel.

Course Title: **Educational Tour**	Course Code: **AA4410**
Credit: 1	L T P **0 0 2**
Year: **2nd**	Semester: **IV**

An Educational Tour will be conducted and a measure drawing exercise will be done by the students.

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Architectural Design – V**	Course Code: **AA5S10**
Credit: 9	L **9** T **0** P **0**
Year: **3rd**	Semester: **V**

UNIT I

Evolution of structural systems

- **TRABEATED-:** Brick and stone, columns and beams.
- **ARCUATED-:** Corbelled, Radiating Arch, Vault and Dome, Squinch and Pendentives.
- **VECTOR STRUCTURE-:** trusses and space frames, slabs, one way and two way, coffers.
- **FORM STRUCTURE-:** Folded slabs, shells, Hyperbola-paraboloid.
- **TENSILE-:** Tents, Cables, and Pneumatic vis-à-vis materials and plan shapes.

Suggested studio exercises

- Making of models of various structural forms with appropriate and innovative materials.
- Making a scale model of important historical buildings incorporating one of the structural forms. e.g. Trabeated-: Parthenon, Arcuated-:Santa Sophia, Parthenon, Vector Active-: Pompidou Center, Form Active-: Sydney Opera House, Tensile-: any of the famous bridges or stadiums.

Reference Books (Current Edition):

- Bousmaha Baiche& Nicholas Walliman, Newfert Architect's Data
- DeChiara & Callender, Time Saver Standards for Building Type
- Pneumatic structures : A Handbook of Inflatable Architecture; by Thomas Herzog
- Tensile Structures (v. 1 & 2); by Frei Otto
- Building Construction Illustrated; by Ching, Francis D. K.
- Form and Forces: Designing Efficient, Expressive Structuresby Allen, Edward and Zalewski, Waclaw
- Long Span Roof Structures; by Committee on Sp Structures of Committee on Metals

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Construction and Materials – V**	Course Code: **AA5S20**
Credit: 6	L **6** T **0** P **0**
Year: **3rd**	Semester: **V**

MATERIALS

UNIT I

Ferrous Metals

Brief study on manufacture, properties and uses of cast iron, wrought iron, pig iron and steel. Market forms of steel - structural steel, stainless steel, steel alloys - properties and uses - current developments.

UNIT II

Aluminium and Aluminium Alloys - brief study on manufacture, properties and uses - Aluminium products -extrusions, foils, castings, sheets, etc.-tin and lead, properties and uses - current developments. Use of nonferrous metals e.g. copper & copper based alloys (brass & bronze), tin, cadmium, chromium, zinc, lead, nickel etc., in architectural construction

UNIT III

Gypsum products: Introduction – Gypsum Board, Suspended Ceiling (Boards & Tiles), Gypsum Plaster, Mineral fibre tiles, Components and Accessories, Jointing and Finishing

CONSTRUCTION

UNIT IV

Steel Trusses Frames, Gates and Steel Components

Structural Steel Sections - types of connections in steel - steel in foundations, columns and beams – and different structural members.

Steel trusses – saw tooth roof truss with north light glazing, simple trusses in steel

Space frames:- single, double & triple layered tubular space, frames with globe connections,

Gates: collapsible gate, entrance gate.

Steel components: Steel doors, (hinged, sliding), steel windows (casement window & sliding window), Steel stairs (dog legged, spiral stair) steel hand rails and balustrade grill designs for windows

UNIT V

Pressed Steel Door Frames.

Metal stud Partitions, single layer and double layer.

UNIT VI

Metal False Ceiling: Different types of ceiling options available in Market.

Use of steel as external cladding material.

Reference Books:

1. Building Construction Illustrated by Francis D. K. Ching
2. Exercises in Building Construction by Edward Allen
3. Gypsum Construction Handbook with Product and Construction Standard; by United States Gypsum Company
4. Design of Building Trusses (Parker/Ambrose Series of Simplified Design Guides); by James Ambrose

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Architectural Structures-V**	Course Code: **AA5010**
Credit: 2.5	L: **2** T: **1** P: **0**
Year: **3rd**	Semester: **V**

UNIT-I

Basics of Soil Mechanics: Soil formation and resulting soil deposits, nomenclature of different soil types, basic physical properties and their inter-relationships, Indian Standard System of Classification.

UNIT-II

Bearing Capacity of Soil: Safe bearing capacity, bearing capacity failure.

UNIT-III

Test on Soil: Soil exploration methods, standard penetration test, dynamic cone penetration test, concept of bore log for soil description, ground water tab

UNIT-IV

Retaining Walls: Use, types and tentative proportioning of retaining walls.

The application of all of the above designing methods should be studied by designing a small module of area not less than 100 sq.m (e.g. 9x8, 6x10 etc.) with objectivity of learning to design basement.

Reference Books:

- Design of Reinforced Concrete, 8th Edition; by McCormac, Jack C.
- Reinforced Concrete Design (7th Edition); by George F. Limbrunner and Abi O. Aghayere
- Design of Concrete Structures; by Nilson, Arthur H

Course Title: **Contemporary Architecture**	Course Code: **AA5020**
Credit: 2.5	L: **2** T: **1** P: **0**
Year: **3rd**	Semester: **V**

UNIT I: Brief introduction of Theory of Design in 20th Century. Emphasis should be on Post Independence Period in Indian Context

UNIT II: Overview of World Architecture since 1970 with the study of Late Modernism, Post Modernism & Desconstructivism

UNIT III: Theories governing contemporary architecture through case studies, evolving architectural trends and their impact on urban built environment

UNIT IV: Emerging Building Typologies with emphasis on Residential Developments, Offices, Skyscrapers, Institutional & Public Buildings

UNIT V: Study of evolving building materials and technologies with an approach towards contemporary challenges e.g. Disaster Mitigation, Energy Crisis, Socio- Economic Settlements

Text Books:

1. William J.R. Curtis, Modern Architecture Since 1900
2. Kiel Moe, Integrated Design in Contemporary Architecture
3. The World of Contemporary Architecture by CERVER

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **History of Architecture – III**	Course Code: **AA5030**
Credit: 1.5	L T P **1 1 0**
Year: **3rd**	Semester: **V**

UNIT I

- Introduction to history and architecture with special emphasis on Stone Age to Neolithic settlement in Europe and around with examples from Carnac and Stonehenge
- **Birth of Civilization:** In reference to the Asia-minor region with nascent cities like Jericho, Catalhoyuk and Hattasus etc.
- Egyptian
- Mesopotamian

UNIT II

- Greek Architecture
- Roman Architecture
- Early Christian Architecture
- Byzantine Architecture

UNIT III

- Romanesque Architecture
- Gothic Architecture
- Renaissance Architecture
- Baroque Architecture

Reference Books:

1. Sir Banister Fletcher, A History of Architecture
2. S. Lloyd & H.W. Muller, History of World Architecture
3. A Global History of Architecture by Francis D. K. Ching, Vikrmaditya Prakash

Course Title: **Building Bye Laws and Code of Practice**	Course Code: **AA5S30**
Credit: 2	L T P **2 0 0**
Year: **3rd**	Semester: **V**

UNIT-I: Familiarizing with Building Bye-laws through Local Developments Authority Guidelines, applicable to Residential and Non Residential building

(Bye laws of MDDA and study the relevant extract from Delhi Building Bye Laws).

UNIT-II: Safety measures mentioned in Building Bye laws like fire protection, seismic considerations and other provisions of National Building Code.

UNIT-III: To make the students familiarize about the various code of conduct for specially able & various services like water supply & sanitation, electrical, mechanical etc.

UNIT-IV: Preparation of complete Local Development Authority drawing for a small two storied building that may have been designed in any of the previous semester. The drawings to also incorporate all the details for getting the plans approved from concerned authorities

Reference Books:

1. National Building Code
2. Mechanical & Plumbing Codes
3. Master plan of any area as specified by the teacher

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Working Drawing**	Course Code: **AA5S40**
Credit: 5	L: **5** T: **0** P: **0**
Year: **3rd**	Semester: **V**

Preparation of complete Local Development Authority drawing for a small two storied building that may have been designed in any of the previous semester. The drawings to also incorporate electrical and plumbing details complete with schedule and all specifications. The Working Drawing and details to include:

- Site plan
- Foundation layout with details of foundations.
- All floor plans.
- All elevations.
- Sections
- Doors and Windows schedule and details
- Electrical Layout in at least one of the two Floors
- Plumbing Layout in at least one of the two Floors
- Details of toilet and Kitchen etc. complete with all fixtures and their specifications.
- Flooring pattern
- Staircases Details
- Details of Grills, Parapet of railings
- Typical wall section showing foundation, DPC, skirting, sill, lintel, slab and terracing details.

Reference Books:

1. Civil Engineering Building Practice by Suraj Singh
2. Building construction drafting and design by John Molnar, P.E

Course Title: **Value Added Programme**	Course Code: **AA5310**
Credit: 2	L: **0** T: **0** P: **4**
Year: **3rd**	Semester: **V**

There will be a workshop on AutoDesk Revit

Faculty of Architecture
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Course Title: **Architectural Design – VI**	Course Code: **AA6S10**
Credit: 9	L **9** T **0** P **0**
Year: **3rd**	Semester: **VI**

UNIT – 1

VILLAGE SURVEY & RURAL HOUSING

Study of the physical, socio economic and cultural aspects of a selected **village** by conducting various surveys to understand the settlement pattern, housing stock and amenities that are existing or required – To understand the linkages between Occupation, Social structure and Religious beliefs and its physical manifestation in the form of the settlement – Identification of a suitable Design intervention that would improve the quality of life – Ex. Design of housing prototypes for a particular community / occupation using rural building materials & cost effective technology. Design exercise may include the design of any facility required such as Primary health centre / Community hall / Farm training centre etc

UNIT – 2

HOUSING – The various types of housing projects in a typical urban scenario can be taken with suitable design parameters that get established after conducting a rigorous study. Analysis of existing design trends & user preferences need to be ascertained. Awareness about special building byelaws applicable for Group housing schemes is essential. In addition to design issues such as security, accessibility, identity, social interaction, comfort, economy etc that would be investigated, the application of Fractals in design can also be explored. Ex. Housing for the poor / Slum dwellers, Multi-storeyed apartments for Govt. / corporate employees, Multi-storeyed condominiums for the rich etc.

Reference Books:

1. Ching, F.D.K., "A Visual Dictionary of Architecture", John Wiley & Sons
2. Norberg-Schulz, C., "Principles of Modern Architecture", Andreas Papadakis
3. New rural housing design theory [Paperback] by Ning Yu Luo Zhong Zhao Zhang Hui Fang
4. Housing Design: A Manualby Bernard Leupen and HaraldMooij
5. The Housing Design Handbook: A Guide to Good Practiceby Levitt, David

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Construction and Materials – VI**	Course Code: **AA6S20**
Credit: 6	L **6** T **0** P **0**
Year: **3rd**	Semester: **VI**

MATERIALS

UNIT – 1

Floor Finishing: Brick flooring, Cement Concrete, Different types of Stones (natural and artificial) used in floor finishing, Terrazzo, Ceramic & Vitrified Tiles, Wooden (natural and artificial). Rubber, cork

UNIT – 2

Thermoplastics and thermosetting plastics –properties and architectural uses of plastics – structural plastics –Reinforced plastics and Decorative laminates-plastic coatings, Adhesives and sealants – Modifiers and Plasticizers

Ex: Thermoplastics – Polythene, Polyvinyl chloride, polyvinyl acetate, Poly-propylene, Polymethyl metha Crylate, Polystyrene, Acrylo-nitrile butadiene styrene, Nylon, Polycarbonate. Thermosetting Plastics-Polyesters resin, Polyurethane, Synthetic resin, Rubber

UNIT – 3

Adhesives and sealants – Introduction, Natural Adhesives – Animal, Cassin,
Bituminous, Thermoplastic Adhesives – Polyvinyl Acetate,
Modifiers and Plasticizers. sealants used for aluminium work, epoxy etc.

UNIT – 4

Ceramics : Terracotta, Faience, Fireclay, Stoneware, Earthen ware, Vitreous China, Porcelain. Jointing and Finishing.

CONSTRUCTION

UNIT – 5

Fabrications of plastics (PVC and UPVC). Primary plastic building products for walls, roof and partitions. Secondary building products for rooms, windows, roof lights, domes, gutters and handrails etc.

UNIT – 6

Construction Using Non-Ferrous Metals (Aluminium)

Aluminium partitions, false ceiling, handrails,
Different types of Structural and curtain walling along with its fitting and fixtures.
Aluminium roofing - north light glazing bar, Aluminium roofing sheets. Use of other
Use of Aluminium and other non ferrous metals in cladding, panelling, and in kitchen fittings.
Aluminium doors - open able, sliding, pivoted.
Aluminium windows - open able, sliding, fixed, pivoted.
Aluminium ventilators - top hung ,bottom hung, pivoted, louvered, fixed.

Reference Books:

1. Goyal, M.M., "Handbook of Building Construction", Thomson Press (I) Ltd
2. Deplazes, A. (Editor), "Constructing Architecture: Materials, Processes, Structures: A Handbook", Birkhäuser
3. Ching, F.D.K., "Building Construction Illustrated", Wiley

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Architectural Structures – VI**	Course Code: **AA6010**
Credit: 2	L: **2** T: **0** P: **0**
Year: **3rd**	Semester: **VI**

UNIT – 1

Foundation

Introduction to foundation, Purpose of foundation, Types of foundation,
Rafts – situations where adopted, raft with basement, water proofing of basements below ground water table Pile foundations – situations where adopted, types of piles, methods of construction, pile capacity from pile loading tests, under reamed piles.

UNIT – 2

Design of R.C.C. Foundation

Raft and pile foundation

UNIT – 3

Footing

Introduction and guidelines for depth for footing, dimensioning of footings on basis of given values of bearing capacity, allowable pressure and soil borelog, codal provisions, use of plate load test data, effect of variation of ground water table.

UNIT – 4

Design of R.C.C. Footing

Design of isolated footing
Design of combined footing

The application of all of the above designing methods should be studied by designing a small module of area not less than 100 sq.m (e.g. 6x10, 12x7 etc.) whose planning should include the projected slab, slab supported on columns etc.

Reference Books:

1. Ghulati, S.K. and Datta, M., "Geotechnical Engineering", Tata McGraw Hill.
2. Varghese, P.C., "Foundation Engineering", Prentice-Hall of India.
3. Ranjan, G. and Rao, A.S.R., "Basic and Applied Soil Mechanics", New Age International (P) Ltd.
4. Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Landscape Architecture**	Course Code: **AA6S30**
Credit: 3	L **3** T **0** P **0**
Year: **3rd**	Semester: **VI**

UNIT – 1

Introduction

Meaning of landscape & its relevance to architecture. Theory of landscape Architecture

UNIT – 2

Landscape Graphics

- Graphic techniques : Drawing trees with different textures. Foliage patterns, tone, contrast and balance, rock and water.
- Conventional symbols in landscape presentations
- Conceptual drawings of indoor & outdoor landscapes

UNIT – 3

Plant Identification

Names and uses of Trees, Shrubs, Water Plants, Ground Cover and Creepers

UNIT – 4

Construction Techniques

Technical Terms, Tools and materials for Hardscape &Softscape, Details of pavements, retaining walls, grass laying, wooden decks, Terrace Gardens and outdoor furniture

UNIT – 5

Urban Landscaping

Landscape conservation, Landscape estimation & management, Regulations & Legal aspects.

Small landscape design proposal incorporating the basics covered above, services & circulation for public & private place like Junctions, River front & Terrace Gardens etc

Reference Books :

1. J. Appleton, The Experience of Landscape
2. Marc, Keane, Japanese Garden Design
3. Ian, McHarg, Design With Nature
4. Basic Landscpe Architecture by Waterman

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Specification and Estimation**	Course Code: **AA6020**
Credit: 1.5	L: **1** T: **1** P: **0**
Year: **3rd**	Semester: **VI**

UNIT – 1

Specification

- Definition, Importance and scope of the subject. Correct form of writing specifications, avoiding ambiguity and conflicting statements. Form and sequence of clauses, study and uses of standard specification viz; drafted by C.P.W.D. etc.
- Writing detailed specifications for various building constructions works e.g. earthwork for foundations, concreting the trenches for foundations, superstructure in cement mortar, R.B. work, plastering and painting, lime punning, flooring, whitewashing, distempering and painting. Snowcem wash, stone masonry, mud phuska, terracing and others.

UNIT – 2

Estimating

- Estimates-types of estimates-approximate and detailed methods of estimating – plinth area method, carpet/ floor area method cubic content method, approximate quantity method and number system, detail estimates procedure of estimating, taking out quantities schedule of rates.
- Exercise in estimating (with different methods) of small buildings, estimating exercises for interior schemes, plumbing work and electrical installations etc.

UNIT – 3

Rate analysis

- Principles of analysis of rates, rates of labour and materials, exercises in rate analysis of different building works, e.g. earthwork for foundations, flooring, timber work etc.
- Introduction to P.W.D. accounts procedure, measurement book, daily labour , muster roll, stores, stock, and issue of material from stock, indent form, imprest account, cash book, mode of payment.

Reference Books:

1. B.N. Dutta, "Estimating and Costing in Civil Engineering", 24th Ed., UBS Publishers Distributors Ltd.
2. S.C. Rangwala, Estimating, Costing & Valuation
3. Rodney D. Stewart; Cost Estimating; 2nd Edition

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Interior and Retail Design**	Course Code: **AA6S40**
Credit: 3	L **3** T **0** P **0**
Year: **3rd**	Semester: **VI**

UNIT-I

THEORY

- Principles of Interior Design and their application.
- Elements of Interior Design – Space, Light and Illumination, Color, Texture, Furniture (movables & built-in), Fittings and Fixtures.
- Understanding the works of Great Masters.
- Modern trends and contemporary attitudes to Interior Design e.g. Modular units, Modern materials

UNIT-II

STUDIO

- Furniture design exercises.
- Design of a small interior space e.g. Mall, Entrance Hall, Conference Room, Executive's office, Residential- Library/toilet/kitchen/rooms etc.

Reference Books:

1. Lorrain Farrelly, Materials & Interior Design
2. Drew Plunkett, Construction & Detailing for Interior Design
3. Basic Interior & Retail Design by Lynne Meshe
4. Basic Interior Architecture by Brooker

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Building Services**	Course Code: **AA6030**
Credit: 1.5	L T P **1 1 0**
Year: **3rd**	Semester: **VI**

UNIT I

ILLUMINATION AND ELECTRICAL SERVICES

Electrical systems – Basic of electricity – single/Three phase supply – protective devices in electrical installation – Earthing for safety – Types of earthing – ISI Specifications. Electrical installations in buildings, Types of wires, Wiring systems and their choice – planning electrical wiring for building – Main and distribution boards. Principles of illumination – Visual tasks – Factors affecting visual tasks – Modern theory of light and colour, Luminous flux – Candle – solid angle illumination – utilization factor –Depreciation factor , Principles of welding

UNIT II

LIGHTING DESIGN

Classification of **lighting** –Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering. Lighting for different places and minimum level of illumination required.

UNIT III

HVAC

Behaviour of heat propagation, thermal insulating materials and their co-efficient of thermal conductivity. **General methods of thermal insulation:** Thermal insulation of roofs, exposed walls. **Ventilation:** Definition and necessity, system of ventilation. Principles of air conditioning Air cooling, Different systems of ducting and distribution, Essentials of air-conditioning system

UNIT IV

Lift Services

Types of Lifts- working of lifts with details of lift section describing various parts of lifts Definitions regarding lifts such as average travel, lift carrying capacity, rated load, rated speed, RTT etc. Installation requirements and the information to be provided by the architect for the installation. Grouping of lifts and design standards of a lift lobby. Function and working of Escalators

Reference Books:

1. Handbook for Building Engineers in Metric systems, NBC
2. Fred Hall & Roger Greeno, Building Services Handbook
3. The Elevator Familyby Evans, Douglas
4. Elevator Design, Construction and Maintenance - 1905by Merchant Books
5. Lighting Design Basicsby Benya, James R., Karlen, Mark and Spangler, Christina
6. Interior Lighting for Designersby Gordon, Gary

Course Title: **Aptitude Building**	Course Code: **AA6310**
Credit: 1	L T P **0 0 2**
Year: **3rd**	Semester: **VI**

Content will be as per the data furnished by concerned Department.

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Practical Training**	Course Code: **AA7510**
Credit: 20	L: **0** T: **0** P: **40**
Year: **4th**	Semester: **VII**

The candidate is required to go on practical training for 16 working weeks in the office/ organization of Architecture. Each student shall be issued an authority letter by the head of the institutions for practical training with the specified organization. The candidate shall report immediately in the given performa duly signed by the head of the organization to the institute about the joining of training. Each candidate shall be provided a log book containing. The performa one for each weeks work (16 Nos.)

1. The trainee is to fill up the work log book weekly during the training period and get it verified by the head of Training office. The work shall be of drawings, specifications report writing, model making and supervising the work at site of construction along with knowhow of the systems of billing and payments etc of records maintenance in Architect office.
2. Every candidate on completion of 16 weeks training shall prepare a complete training report on assignments to which he/ she was associated during the training; supported by the drawing prints/ photographs and other relevant documents.
3. On completion of the training every student shall get a certificate issued by the head of the organization in the performa given by the institution without which the training shall not be recognized. Head of the office is also required to send a report; about the trainee's work, conduct skill etc; the points relevance to Architecture student; in a sealed cover to the Institute.
4. The report shall be submitted to the institute's training incharge before the commencement of the classes of IVth yr. IIndsem or (VIII sem) on the date specified by the institution.
5. The training Report, log book & certificate along with confidential report shall be examined by the Internal jury of the Institute faculty and award the sessional marks.
6. There shall be viva examination conducted by one internal and one external examiner on the report of the candidate to award the examination marks (out of 400) assigned to it. The external and the internal examiners shall be approved by the university.

Course Title: **Training Report Presentation**	Course Code: **AA7520**
Credit: 7	L: **0** T: **0** P: **14**
Year: **4th**	Semester: **VII**

The training report will be evaluated during the practical/ viva exam.

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Architectural Design – VIII**	Course Code: **AA8S10**
Credit: 9	L **9** T **0** P **0**
Year: **4th**	Semester: **VIII**

UNIT I

Office buildings – Office spaces require special care in design & detailing. Students get exposed to the various services, structural systems and vertical access systems such as elevators, escalators etc ofmulti-storeyed buildings. Knowledge about various types of cores, fire fighting systems and specialbuilding rules applicable to multi-storeyed buildings are implied. Scholars will be required to do theInterior design scheme in detail. Ex. Multi-storeyed office buildings that do not exceed G+6 floors.

UNIT II

Commercial buildings – Commercial spaces like Malls, Hotels etc.

Acoustical study should also be there with reference to different buildings- multiplexes, auditorium, conference room etc. The teacher will introduce acoustical terminology, concepts and defects as well as the latest acoustical materials available

Reference Books:

1. Ching, F.D.K., "A Visual Dictionary of Architecture", John Wiley & Sons
2. Norberg-Schulz, C., "Principles of Modern Architecture", Andreas Papadakis
3. The Office Building of the Future; Pickard Chilton
4. Office Space Planning: Designs for Tomorrow's Workplace (Professional Architecture); Marmot, Alexi and Eley, Joanna
5. Shopping Malls; YealXie
6. Van Chris Uffelen; Malls and Department Stores

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Construction and Materials – VIII**	Course Code: **AA8S20**
Credit: 6	L **6** T **0** P **0**
Year: **4th**	Semester: **VIII**

MATERIALS

UNIT I

Materials with special reference to interiors

Floor Coverings, Ceiling Finishes, Window Dressings, Fabrics / Upholstery, Hardware

UNIT II

Damp Proofing and Water Proofing

Damp proofing: Hot applied and cold applied – Emulsified asphalt, Bentonite clay. Butyl rubber, silicones Vinyl's, Epoxy resins and metallic water proofing materials, their properties and uses.

Water proofing: water proofing membranes such as rag, asbestos , glass felt, plastic and synthetic rubber- vinyl, butyl rubber, polyvinyl chilnide – prefabricated membranes sheet lead, asphalt their properties and uses.

Application: application of the above in basement floor, swimming pool, and terraces

CONSTRUCTION

UNIT III

Pre - Fabrication

Pre- fabrication: Introduction to pre- fabrication technology, column and beam system /panel system / box system, advantages of pre- fabrication. Pre- fabrication techniques and various building components – foundation, walls, floors, roofs, doors, windows,

Ferro cement products: sanitary and service core unit, trusses and rafters, water tanks. Design: Design considerations for pre fabrications

UNIT IV

Modern Formwork techniques in steel. Lift slab construction and slip form formwork and formwork of special profiles.

D.P.C- Vertical and horizontal (basement, sunken floors, roof slab etc)

UNIT V

Special structures- Definition –single, double and multilayered grids- two way and three way space grids connectors, Grid domes-various forms-Geodesic domes.

Shell, Folded Plates and Tensile Structures – Shell types, Classification as per BIS- Relative merits and applicability, Folded plates- types-comparison with shell- applicability, suspended cable structures- types of cable network systems- shapes of cable suspended systems, examples of tensile membrane structures- types of pneumatic structures.

UNIT VI

Modular Coordination

Aims, basis, planning, dimensioning,

Assembly of components, tolerances, modules, reference system, grids, positioning of functional elements – slabs, walls, staircases; Standardization in buildings' design and their components

Reference Books:

1. Deplazes, A. (Editor), "Constructing Architecture: Materials, Processes, Structures: A Handbook", Birkhäuser
2. Ching, F.D.K., "Building Construction Illustrated", Wiley
3. Prefabricationsby Gary Robins
4. Concrete Folded Plate Roofsby Wilby

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Architectural Structures – VIII**	Course Code: **AA8010**
Credit: 2.5	L **2** T **1** P **0**
Year: **4th**	Semester: **VIII**

UNIT-I

Properties of Structural Materials
Steel, masonry and B.I.S. specifications, design loads as per B.I.S. codes.

UNIT-II

Riveted and Welded Connections:
Simple connections and connections subjected to moments (simple cases only

UNIT-III

Members Subjected to Axial Compression
Steel struts and columns including built-up columns.

UNIT-IV

Beams
Steel beams and built-up sections.

UNIT-V

Introduction to Steel Trusses & Industrial Buildings
Case Study

UNIT – VI

Bases and Footings
Types, design of slabs and gusseted bases.

UNIT – VII

Masonry
Walls, columns and footings.

The application of all of the above designing methods should be studied by designing a small module of area not less than 100 sq.m (e.g. 6x10, 12x7 etc.).

Reference Books:

1. Design of Steel Structures by ABU- SABA
2. Design of Steel Structures by Edwin H. Gaylord, Charles N. Gaylord and James E. Stallmeyer
3. Duggal, S.K., "Design of Steel Structures", 2nd Ed., Tata McGraw Hill
4. Dayaratnam, P., "Brick and Reinforced Brick Structures", Oxford & IBH Publishing Co.
5. Arya, A.S., "Masonry and Timber Structures Including Earthquake Resistant Design", Nem Chand Bros.
6. Arya, A.S. and Ajmani, J.L., "Design of Steel Structures", Nem Chand Bros.
7. Chandra, R., "Design of Steel Structures", Standard Book House.

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Building Economics**	Course Code: **AA8020**
Credit: 1.5	L: **1** T: **1** P: **0**
Year: **4th**	Semester: **VIII**

UNIT I

Elementary Concepts of Economics: Utility, Demand and Supply, Wants, Cost, Value, Price, Micro & macro Economics

UNIT II

Meaning & Scope of Building Economics : Issues Importance of Building Economics

UNIT III

Project Costing : Initial Costing, Elements of Cost Components, Furniture Costing, Different Types of Costs and their impact on Building Projects, Non Monetary cost.

UNIT IV

Benefits of Buildings : Monetary and Non Monetary benefits of buildings

UNIT V

Economic Performance of Building : Types of Economic Performance, Accounting for Risks & Uncertainty , Techniques of Performance , Analysis , Cost Benefit Analysis, Rate of Return Analysis etc

UNIT VI

Feasibility Analysis : Concept and Types of Feasibility, Feasibility Analysis

Reference Books:

1. Thorbjoern Mann, Building Economics for Architects

Course Title: **Architectural Journalism**	Course Code: **AA8030**
Credit: 1.5	L: **1** T: **1** P: **0**
Year: **4th**	Semester: **VIII**

UNIT-I

INTRODUCTION : Basic understanding of the subject and related theories

UNIT-II

JOURNALISM : Analysis of recent historical and contemporary examples of written and journalistic criticism of architecture, including selected writings by Indian and overseas critics; discursive techniques, analysis of major critical themes, thematic categories in architectural writing over the past three centuries.

UNIT-III

ANALYSIS OF WORKS : Works of Indian and international writers and critics will be presented and discussed. Seminars on Indian architectural writers, journalists and critics

Reference Books:

1. Architecture and the Journalism of Ideas by Bender Thomas.
2. Architectural Criticism and Journalism : Global Perspectives by Mohammad Al Asad and Majd Musa

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Town Planning**	Course Code: **AA8S30**
Credit: 3	L **3** T **0** P **0**
Year: **4th**	Semester: **VIII**

UNIT-I

Introduction:
Definitions of **town planning**, levels of planning and steps for preparation of a town plan, survey techniques in planning, concepts, functions, components and preparation of a development plan. Planning concepts related to garden city, geddesian triad, neighbourhood planning, radburn layout, satellite towns and ribbon development.

UNIT-II

Ancient Planning Systems:
Indus valley civilization - Mohenjodaro, Harappa, Extracts from Chanakya's Arthasastra, Manasara's Vastushastra, planning thought behind Fatehpur Sikhri, Shahjahanabad, Jaipur and Delhi

UNIT-III

Town Planning Terminology:
Land use, Concept of F.A.R. and Density, Zoning and Subdivision Regulations, Master Plan

UNIT-IV

The Planning Process:
Town planning surveys, Preparation of MASTER PLAN for old and new towns

UNIT-V

Transport Planning:
Traffic and urban environment. Traffic design Elements. Traffic control devices, road intersections

UNIT – VI

Development Laws:
Need of urban development laws, study of evolution of urban development laws in India, development authority, land acquisition act, land acquisition process, land ceiling act etc.

Reference Books:

1. Arthur B. Gallion and Simon Eisner, The Urban Pattern – *City planning and Design*
2. Rame Gowda, *Urban and Regional planning*
3. John Ratcliffe, *An Introduction to Town and Country Planning*

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Sustainable Buildings**	Course Code: **AA8210**
Credit: 2	L **1** T **0** P **2**
Year: **4th**	Semester: **VIII**

UNIT – 1

Introduction

- Definition & concept of sustainability
- Need of sustainable buildings
- Features of sustainable buildings

UNIT – 2

SOLAR ENERGY & BUILDING

Solar geometry and built form – Various techniques of shading to reduce heat gain in tropical climate – Various methods of Maximising exposure to solar radiation in cold & temperature climate. Heating & cooling loads – Energy estimates - Energy conservation – Efficient day lighting – Solar Water heating system**.** Exercises on heating and cooling load calculations in buildings

UNIT – 3

PASSIVE COOLING CONCEPTS

General principles – Evaporative cooling, Nocturnal radiation cooling, Passive Dessicant cooling, induced ventilation, earth sheltering, Berming, Wind Towers, earth – Air tunnels, Curved Roofs & Air Vents, Insulation, Vary Thermal wall etc.Case studies on buildings designed with passive cooling techniques.

UNIT – 4

OVERALL DESIGN CONCEPTS

Land form & orientation – Vegetation & Pattern – Water Bodies – Open Space & Built form - **Plan form &Elements** – Roof form – Fenestration pattern & Configuration – Building envelope & finishes

UNIT – 5

INTELLIGENT BUILDING

- Definition & Concept Of Intelligent Building
- Services in Intelligent buildings- lighting, hvac, plumbing, security, access control, CCTV & alarm systems, audio- visual & entertainment system etc.

Reference Books:

1. MiliMajunder, Teri – *Energy – Efficient Bldg in India* – Thomson Press , New Delhi
2. J.K Nayak& Others , *Energy Systems Energy Group*,- Isa Annal Of Passive Solar Architecture
3. George Basid& Others – *Energy Performance of Bldg*– CRC Press, Florida
4. New Direction in Sustainable Design by PARR
5. Sustainable Construction: Green Building Design and Delivery; by Kibert, Charles J.
6. Sustainable Building Systems & Construction for Designers; by Lisa M. Tucker

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Environmental Studies**	Course Code: **AA8040**
Credit: 1.5	L: **1** T: **1** P: **0**
Year: **4th**	Semester: **VIII**

UNIT I

Introduction
Definition, Scope and importance, Need for awareness

UNIT II

Natural Resources
Renewable and Non Renewable Resources

UNIT III

Eco System
Concept, Structure & Function of an Eco System, Flow of Energy, Food Chains, Types of Eco Systems

UNIT IV

Environmental Pollution
Definition, Causes, Effects, Types of Pollution, Control Measures to check different pollution

UNIT V

Social Issues & Environment
Unsustainable to sustainable development, Urban problems related to energy, Wasteland Reclamation, Environmental Protection Act

UNIT VI

Environmental Impact Assessment
Introduction, Need and importance of EIA study, Process

Reference Books:

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner
2. Down to Earth, Centre for Science and Environment
3. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T.2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Architectural Design – IX**	Course Code: **AA9S10**
Credit: 9	L **9** T **0** P **0**
Year: **5th**	Semester: **IX**

Designing for sustainability – Sustainable architecture and planning has become vital factor in the design of all buildings because the building activity is considered as one of the major pollutants of the natural environment. Study of the various techniques of Energy-efficient design and recycling technologies for water & wastes is mandatory as these have to be incorporated in the design proposals. Awareness about LEEDS rating and best practices is expected.

UNIT I

Institutional buildings – These are buildings with complex spatial organizations, multifunctional spaces, large spans and variable circulation patterns. Environmental issues are emphasized and the Design studio aims to inculcate the techniques of designing for sustainability. Students are expected to
do the landscape layout in detail to develop appreciation of a holistic environmental design. Ex. College / single specialty Hospital / theatre etc.

UNIT II

Urban intervention Projects:

- Design of buildings/ building complexes in specific urban context such as heritage zones, near existing and within built environments.
- Redevelopment, rehabilitation and urban improvement projects.
- Development Projects such as Universities, District Centers and City Centers etc.

Reference Books:

1. Ching, F.D.K., "A Visual Dictionary of Architecture", John Wiley & Sons
2. Norberg-Schulz, C., "Principles of Modern Architecture", Andreas Papadakis
3. University Planning and Architecture: The Search for Perfection by Coulson, Jonathan, Roberts, Paul and Taylor, Isabelle

Faculty of Architecture
Course Structure for B.Arch.
Batch: 2016-21

Course Title: **Advanced Construction**	Course Code: **AA9S20**
Credit: 4	L: **4** T: **0** P: **0**
Year: **5th**	Semester: **IX**

MATERIALS

UNIT – 1

CONSTRUCTION EQUIPMENTS

Electric hand tools, Vibrators, Power Floats, Pumps, Rollers. Earth Moving & Excavation: Dozers, Scrapers, Graders, Shovels, Skimmers, Backactor, Dragline, Trenchers. Transportation : Lorries, Trucks, Dumpers, Elevators, Conveyors, Hoist, Cranes (mobile, static, tower). Concrete Mixers, Pumps etc.

UNIT – 2

DEFECTS AND REMEDIES

The study of various defects in buildings and their remedies, Defects caused by dampness, applied forces and changes in size

UNIT – 3

Fire Protection

Causes and spread of fire, Fire detection equipments, Fire extinguishers and other fire fighting equipments, Methods of firefighting. Combustibility of materials and fire resistance. Means of escape, fire doors, water curtains etc. Code of Safety prescribed in National Building Code

UNIT – 4

Special Details

- Construction details associated with the services of the buildings (e.g. drainage, water supply, septic tank, fire fighting etc.)
- Construction details associated with the context of site and application (e.g.drainage system in mountains, industrial construction, geographical challenges like floods and drought etc.)

The examples mentioned are not mandatory but explanatory.

Reference Books:

1. Goyal, M.M., "Handbook of Building Construction", Thomson Press (I) Ltd
2. Deplazes, A. (Editor), "Constructing Architecture: Materials, Processes, Structures: A Handbook", Birkhäuser
3. Ching, F.D.K., "Building Construction Illustrated", Wiley

Faculty of Architecture
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Batch: 2016-21

Course Title: **Professional Practice – I**	Course Code: **AA9010**
Credit: 2.5	L: **2** T: **1** P: **0**
Year: **5th**	Semester: **IX**

UNIT – 1

Role of Professional Bodies: The Indian Institute of Architects, its working constitution and byelaws, categories of memberships, election procedures; The Uttar Pradesh Architects Association

UNIT – 2

Architects' Act 1972: Detail study of the act, Council of Architecture; Procedures of membership

UNIT – 3

Scale of Charges: Conditions of engagement of an architect – Duties; Responsibilities and liabilities of a professional architect; Scale of charges, mode of payment etc.

UNIT – 4

Code of Professional Conduct: Clauses governing conduct of professional architect.

UNIT – 5

Architectural Competition: Types of competitions; need and procedure for conducting competitions.

UNIT – 6

Tender and Contract

Type of building contracts, their demands, Preparation of tender documents, method of inviting tenders, opening of tenders, preparation of comparative statement, recommendation and award of projects, preparation of contract documents, general conditions of contract, interim certificated, defect liability period, retention amount and virtual completion

Reference Books:

1. R H. Namavati, Professional practice
2. Hand book on Professional Practice by I. I. A,

Faculty of Architecture
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Course Title: **Research Skills and Project Introduction**	Course Code: **AA9020**
Credit: 2.5	L **2** T **1** P **0**
Year: **5th**	Semester: **IX**

UNIT – 1

Analysis: Content analysis, secondary data analysis. Understanding the relative advantages & disadvantages and application of various methods mentioned above & choosing a method appropriate for a research to achieve its objective.

UNIT – 2

Data Documentation & Analysis: Understanding the nature of data collected and methods of analysis suited for that data (graphical/ numerical/ descriptive). Converting data into numerical form

UNIT – 3

Introduction To The Statistics: Introduction to the simple statistical methods of analyzing numerical data- frequencies/ percentages/ mean/medium/mode. Inferring from the data & interpreting the meaning of those inferences

UNIT – 4

Presentation & Reporting: Presentation of the data: Techniques of presenting the numerical data- graphical (pie charts, Bar charts, line graphs etc.) – tabulations, verbal qualitative data, architectural drawings/maps.

UNIT – 5

Reporting the Research: Different sections of a research report, technical writing & language (tense, voice etc.), Formatting of a report

Reference Books:

1. Research Methodology : Methods and techniques by C.R.Kothari.
2. Architectural Research Methods by Linda Groat, David Wang.

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Course Title: **Construction and Resource Management**	Course Code: **AA9030**
Credit: 2.5	L **2** T **1** P **0**
Year: **5th**	Semester: **IX**

UNIT I

- Need for construction management, its aims and objectives and available management tools.
- Role of architect in construction management

UNIT II

- Management techniques and tools for one off projects
- Management techniques and tools for repetitive projects.
- Site clearance, safety precaution, noise and pollution control.

UNIT III

- Challenges of managing people in construction; organization and management theory; HRM theory;
- strategic HRM approaches;

UNIT IV

Operational HRM approaches; employee relations; employee empowerment; diversity and work/life balance; employee welfare; strategic human resource development; employment legislation

Reference Books:

1. Construction Planning and Management; by P.S.Gehlot.
2. Project : Appraisal, Analysis. Financing, Implementation and review; by Prassana, Chandra.
3. Construction Project Management: A Complete Introduction; by Alison Dykstra
4. Project Management For Dummies; by Portny, Stanley E.
5. Construction Management; by Daniel W. Halpin
6. Resource Management for Construction: An Integrated Approach (Building & Surveying Series); by M.R. Canter

Faculty of Architecture
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Course Title: **Seminars**	Course Code: **AA9210**
Credit: 3.5	L **1** T **0** P **5**
Year: **5th**	Semester: **IX**

There will be seminars on some contemporary and other important topics as decided by the teacher. All the discussion will be in studio classes. After the completion of study students will prepare a report which the internal and external viva will be organized. Some of the topics for seminars may be as following-

- Services in a Hotel
- Study of housing
- Sustainable Design
- Contemporary Construction Technology

Topics mentioned above are only suggestive not mandatory.

Course Title: **Visual Arts and Communication** ***(Elective)***	Course Code: **AA9610**
Credit: 1	L **0** T **0** P **2**
Year: **5th**	Semester: **IX**

UNIT – 1

Theory of Visual Communication

- Introduction & meaning of visual communication
- Visual communication theories
- Psychology of visual language
- Elements of visual design

UNIT – 2

Virtual Environment

- Introduction
- Architectural implications

UNIT – 3

Application

- Discussion & analysis of various types of communications
- Media including visual identities
- Study & application of drawing & other communication skills for architects
- Digital arts & presentations

Course Title: **Waste Management** ***(Elective)***	Course Code: **AA9620**
Credit: 1	L **0** T **0** P **2**
Year: **5th**	Semester: **IX**

UNIT I

Introduction to environment, ecosystem, food chain, energy flow etc

UNIT II

Municipal Solid Waste

Definition, source and types of solid waste, composition, determinants of solid waste, methods of sampling and characterization

UNIT III

Collection and Transfer

Collection of waste, collection services, collection system, equipments, time and frequency of collection, factors affecting collection, collection routes, preparation of master schedule

Transfer and transport operation need, transfer stations, types, transport means and methods, location of transport stations, selection of location, operation and manitenance

UNIT IV

Processing Techniques and Recovery of Energy

UNIT V

Disposal of Solid Waste

Refuse Disposal, various methods, incinerations, features of incinerator, site selection and plant layout of incinerator, sanitary landfill method, advantages and disadvantages of sanitary landfill

Reference Books:

1. George Techobanoglous et al "Integrated Solid Waste Management" McGraw- Hill, 1993
2. Techobanoglous Thiesen Ellasen; Solid Waste Enginnering Principles and Mnagement, McGraw-Hill 1997
3. Blide A.D. &Sundaresan, B.B, "Solid Waste Management in Developing Countries" INSDOC, 1993

Course Title: **Value Added Programme**	Course Code: **AA9310**
Credit: 2	L **0** T **0** P **2**
Year: **5th**	Semester: **IX**

*There will be a workshop on **3DS MAX***

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Course Title: **Architectural Thesis**	Course Code: **AA0S10**
Credit: 21	L: **21** T: **0** P: **0**
Year: **5th**	Semester: **X**

Each student is required to conduct an intensive study and present a design thesis on any of the design topics. The students should submit synopsis for at least three different, design or research oriented topics, to the respective Institution, of which one will be approved to carry on the research and design. Each student shall be attached with a faculty member who will guide his work. The arrangement for the assessment of the progress through the semester for all the students and a 'Programme schedule' will be declared separately for each session by the respective Institution.
The work of student should result into a 'Design Proposal' based on the complete and detailed study of site including its selection, topography, climate, spatial requirements of the project, special functional and physical needs of the project, and standard data, construction and services and all other factors that the involved with a particular thesis topic.

At least two of the following items, for complete design or an approved part thereof, should be covered in full detail and included in the design and presentation, along with the final design proposal-

- Structural calculations and design.
- Detailed estimate and specification.
- Working drawing and construction details.
- Proposal for Mechanical services to cover 'Air-conditioning & Mechanical conveying system,
- Proposal for Electrical Services & Illumination.
- Proposal for Water supply and waster disposal services.
- Proposal for Acoustical design & specification.
- Proposal for Interior design-including furniture, fitting and finishes.
- Landscape design proposals in detail.

The design proposal should be prepared and presented with the help of charts, drawings, perspective views, models and other audio-visual aids. A thesis report must also be prepared and submitted in one soft copy (on CD) and three hard copies (one to be returned to the student) type written and bound together with prints and photographs of all the drawing & models. The thesis report should explain the objectives, scope, case studies, literate study-research & data, design concept/ approach, design proposals, construction programming & financing etc. The original drawings, models and one copy of thesis report will be returned the students in due course of time as decided by the respective Institution.

Thesis Jury:

The final assessment of the thesis will be made through a panel of external jury consisting of two External Experts, Guide, Thesis Coordinator & HOD/ Principal/ Director as chairperson.

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Course Title: **Professional Practice-II**	Course Code: **AA0010**
Credit: 2.5	L **2** T **1** P **0**
Year: **5th**	Semester: **X**

UNIT – 1

Valuation: Valuation of immovable properties, elements of valuation and factors affecting valuation; Techniques of valuation of landed and building property; Value classification and types of valuation.

UNIT – 2

Easement: Introduction to various easements processes, and precautions to protect easement rights.

UNIT – 3

Arbitration: Arbitration, Arbitrator, Umpire, Nature of arbitration, Appointment, Conduct, Powers and duties of arbitrators and umpires; Procedure of arbitration and preparation of awards

UNIT – 4

Office organization & Administration: Professional organization, setting of practice, salaried appointments, public sector, private sector jobs, procedure of operation in government organization.

Reference Books:

1. R H..Namavati, Professional practice
2. Hand book on Professional Practice by I. I. A,

Faculty of Architecture
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Course Title: **Disaster Management** *(Elective – A)*	Course Code: **AA0610**
Credit: 2	L T P **1 0 2**
Year: **5th**	Semester: **X**

UNIT I

- Introduction to disaster & types of disaster
- Disaster profile in India

UNIT II

- Causes & effects of natural hazards on buildings
- Buildings in earthquake & flood zone areas- conventional construction techniques

UNIT III

- Earthquake resistant construction- advanced techniques

UNIT IV

- Responsibilities of an architect in disaster mitigation
- Role of disaster management team
- Agencies involved in disaster management in India

Reference Books:

1. F.C.Cony et.al – *Issue and problems in the prevention of disaster and housing* – A review of experiences from recent disasters – Appropriate reconstruction and training information centre, 1978.
2. S.Ramani, *Disaster management – Advanced course on modern trends in housing* – SERC, Vol 2, Chennai, 1980

Course Title: **Urban Design** *(Elective – A)*	Course Code: **AA0620**
Credit: 2	L T P **1 0 2**
Year: **5th**	Semester: **X**

UNIT I

Introduction :Role of Architects, Urban Designers & Planners

UNIT II

Understanding the Evolution, basic concepts & Theories of UD - Place & Space, Positive & Normative theory, Idea of growing whole, Overriding rule, 7 detailed rules of growth etc. Patterns & Ingredients of the city

UNIT III

Reading Cities- Morphological Dimension, Perceptual Dimension, Social Dimensions, Visual Dimensions, Functional Dimensions, and Temporal Dimensions

Reference Books:

1. *Image of the city* - Kevin Lynch
2. *Architecture of town and cities* - Paul D. Speriregon, The MIT press
3. *Architecture and the urban experience* - Raymond J Curran. Van Nostrand Reinhold Company
4. *Urban design* – Ornament and decoration , Cliff Moughtin, Bath Press
5. *The urban pattern* - Arthur B Gallion, CBS publishers

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Course Title: **Earthquake Resistance Structures** ***(Elective – A)***	Course Code: **AA0630**
Credit: 2	L **1** T **0** P **2**
Year: **5th**	Semester: **X**

UNIT I

An Introduction to Building Safety from Natural Hazards- Earthquake, Fire Safety in Buildings, Cyclone Effects, Landslide, Flood etc

UNIT II

Elementary Seismology- Earthquake occurrence in the world, plate tectonics, faults, earthquake hazard maps of India, Causes of Earthquake, Seismic Waves, epicenter, seismology instruments

UNIT III

Site Planning, Building Norms, Architectural Design Concepts for Earthquake Resistance

UNIT III

Performance of Ground & Buildings in Past Earthquakes- Behaviour of various types of buildings, behaviours of non structural elements like services, fixtures, mountings, Case studies of Earthquake resistant buildings

Reference Books:

1. Improving Earthquake & Cyclone Resistance of Structures; by Shekhar Chandra Dutta & ParthSarthi Mukhopadhyay

Course Title: **Alternate Construction Technology** ***(Elective – B)***	Course Code: **AA0640**
Credit: 2	L **1** T **0** P **2**
Year: **5th**	Semester: **X**

- Cost Efficient Technology.
- Sustainable Vernacular Technology
- Organic Material Construction Technology (Bamboo, Grass, Wood.etc)
- Regional Innovations in Construction Technology (World Specific Regions)

Reference Books:

- Vernacular Architecture : An Illustrated handbook by R.W.Brunskill.
- Gautam Bhatia, Lauri Baker, life work, writings, New Delhi, India, Penguin Books, ISBN 0-14-015460-4

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Course Title: **Advanced Building Services** ***(Elective – B)***	Course Code: **AA0650**
Credit: 2	L: **1** T: **0** P: **2**
Year: **5th**	Semester: **X**

Integration of various building services in architectural design of multi storey building. The services may include- HVAC, sanitary services, garbage disposal, lighting design, vertical transport system, electrical installation etc.

UNIT I

Water Supply and Plumbing Services in High Rise Buildings

UNIT II

Sanitation & Waste Disposal System in High Rise Buildings

UNIT III

Mechanical and Communication System in High Rise Buildings (elevator, escalators etc)

UNIT IV

Case Study

Reference Books:

- Sanitation, Drainage and Water Supply by Mitchell
- Heating Hot Water Supply by Hall

Course Title: **Advanced Structures** ***(Elective – B)***	Course Code: **AA0660**
Credit: 2	L: **1** T: **0** P: **2**
Year: **5th**	Semester: **X**

Exploration of issues related to structural design from supporting to roofing systems through the design of ongoing studio project to provide practical insight and interaction between architectural design and appropriate structures

DIT UNIVERSITY
Dehradun

Course Structure & Detailed Syllabus

of

B. PHARM.

Batch 2016-20

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Year: 1st **Semester: I**

Course Code	Course Title	L	T	P	Credit
Theory					
NA1010	Pharmaceutics-I	3	0	0	3
NA1020	Pharmaceutical Analysis – 1	3	0	0	3
NA1030	Pharmaceutical Chemistry-1 (Inorganic Chemistry-I)	3	0	0	3
NA1040	Pharmacology-I (Anatomy, Physiology & Basic Pharmacology)	3	0	0	3
JA1060 NA1050	Applied Maths **or** Applied Biology	3	0	0	3
HA1210	Professional Communication-I	3	0	1	3.5
Practical					
HA1310	Soft Skill Development	0	0	2	1
NA1110	Pharmaceutics-I	0	0	4	2
NA1120	Pharmaceutical Analysis – 1	0	0	4	2
NA1130	Pharmaceutical Chemistry-1 (Inorganic Chemistry-I)	0	0	4	2
NA1140	Pharmacology-I (Anatomy, Physiology & Basic Pharmacology)	0	0	4	2
					27.5

Year: 1st **Semester: II**

Course Code	Course Title	L	T	P	Credit
Theory					
NA2010	Physical Pharmaceutics (Pharmaceutics II)	3	0	0	3
NA2020	Pharmaceutical Organic Chemistry–I (Pharmachemistry-II)	3	0	0	3
NA2030	Pharmacognosy- I	3	0	0	3
NA2040	Pharmacology-II (Anatomy, Physiology & basic Pharmacology-II)	3	0	0	3
HA2210	Professional Communication-II	3	0	1	3.5
Practical					
NA2120	Physical Pharmaceutics (Pharmaceutics II)	0	0	4	2
NA2130	Pharmaceutical Organic Chemistry–I (Pharmachemistry-II)	0	0	4	2
NA2140	Pharmacognosy- I	0	0	4	2
DA2150	Computer Fundamental and Applications	0	0	4	2
					23.5

Faculty of Pharmacy
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Batch: 2016-20

Year: 2nd **Semester: III**

Course Code	Course Title	L	T	P	Credit
Theory					
NA3010	Physical Pharmaceutics II (Pharmaceutics III)	3	0	0	3
NA3020	Pharmaceutical Organic Chemistry- II (Pharmaceutical chemistry III)	3	0	0	3
NA3030	Pharmacognosy-II(Pharmacognosy and Phytochemistry)	3	0	0	3
NA3040	Pharmacology-III (Pathophysiology & Pharmacology- I)	3	0	0	3
NA3050	Manufacturing Operations-I(Pharmaceutics IV)	3	0	0	3
Practical					
NA3110	Physical Pharmaceutics II(Pharmaceutics III)	0	0	4	2
NA3120	Pharmaceutical Organic Chemistry- II (Pharmaceutical Chemistry III)	0	0	4	2
NA 3130	Pharmacognosy-II	0	0	4	2
NA 3140	Manufacturing Operations-I(Pharmaceutics IV)	0	0	4	2
					23

Year: 2nd **Semester: IV**

Course Code	Course Title	L	T	P	Credit
Theory					
NA4010	Pharmaceutical Biotechnology & Microbiology	3	0	0	3
NA4020	Pharmaceutical Analysis-II	3	0	0	3
NA4030	Bulk drugs Production (Pharmaceutical Chemistry IV)	3	0	0	3
NA4040	Pharmacology-IV (Pathphysiology& Pharmacology-II)	3	0	0	3
NA4050	Manufacturing Operations-II(Pharmaceutics-V)	3	0	0	3
NB4060	Environmental Studies	3	0	0	3
Practical					
NA4110	Pharmaceutical Biotechnology & Microbiology	0	0	4	2
NA4120	Pharmaceutical Analysis-II	0	0	4	2
NA4130	Bulk Drugs Production(Pharmaceutical Chemistry IV)	0	0	4	2
NA4150	Manufacturing Operations-II(Pharmaceutics-V)	0	0	4	2
NA4410	Industrial Tour Report	-	-	-	1
					27

Faculty of Pharmacy
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Year: 3rd **Semester: V**

Course Code	Course Title	L	T	P	Credit
Theory					
NA5010	Pharmaceutical Technology-I (Pharmaceutics- VI)	3	0	0	3
NA5020	Medicinal Chemistry-I (Pharmaceutical Chemistry V)	3	0	0	3
NA5030	Pharmacognosy-III	3	0	0	3
NA5040	Pharmacology-V	3	0	0	3
NA5050	Biochemistry (Pharmaceutical Chemistry-VI)	3	0	0	3
Practical					
NA 5110	Pharmaceutical Technology-I (Pharmaceutics- VI)	0	0	4	2
NA 5120	Medicinal Chemistry-I (Pharmaceutical Chemistry-V)	0	0	4	2
NA5130	Pharmacognsoy-III	0	0	4	2
NA5140	Pharmacology-V	0	0	4	2
NA 5150	Biochemistry (Pharmaceutical Chemistry-III)	0	0	4	2
					25

Year: 3rd **Semester: VI**

Course Code	Course Title	L	T	P	Credit
Theory					
NA6010	Pharmaceutical Technology-II (Pharmaceutics-VII)	3	0	0	3
NA6020	Medicinal Chemistry-II (Pharmaceutical Chemistry-VII)	3	0	0	3
NA6030	Plant Biotechnology (Pharmacognosy-IV)	3	0	0	3
NA6040	Pharmacology-VI	3	0	0	3
JA6050	Biostatistics	3	0	0	3
Practical					
NA6110	Pharmaceutical Technology-II(Pharmaceutics-VII)	0	0	4	2
NA6120	Medicinal Chemistry-II (Pharmaceutical Chemistry-VI)	0	0	4	2
NA6130	Pharmacology-VI	0	0	4	2
NA6310	Aptitude Building	0	0	2	1
NA6320	Professional Communication	0	0	4	2
					24

Faculty of Pharmacy
Course Structure for B.Pharm.
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Year: 4th **Semester: VII**

Course Code	Course Title	L	T	P	Credit
Theory					
NA7010	Biopharmaceutics & Pharmacokinetics (Pharmaceutics- VIII)	3	0	0	3
NA7020	Pharmacopoeial standards	3	0	0	3
NA7030	Pharmacognosy V (Industrial Pharmacognosy)	3	0	0	3
NA7040	Pharmacology-VII	3	0	0	3
NA7050	Pharmaceutical Management	3	0	0	3
	Elective	3	0	0	3
Practical					
NA7110	Biopharmaceutics& Pharmacokinetics (Pharmaceutics- VII)	0	0	4	2
NA7130	Pharmacognosy V (Industrial Pharmacognosy)	0	0	4	2
NA7140	Pharmacology-VII	0	0	4	2
	Elective for Minor Project	0	0	4	2
NA7510	Report on Industrial Training	0	0	4	4
					30

Year: 4th **Semester: VIII**

Course Code	Course Title	L	T	P	Credit
Theory					
NA 8010	Industrial Manufacturing Pharmacy (Pharmaceutics-IX)	3	0	0	3
NA 8020	Pharmaceutical Jurisprudence (Pharmaceutics X)	3	0	0	3
NA8030	Instrumental Analysis (Pharmaceutical Analysis III)	3	0	0	3
NA8040	Medicinal Chemistry II (Pharmaceutical Chemistry VIII)	3	0	0	3
NA8050	Industrial Psychology	3	0	0	3
	Elective	3	0	0	3
Practical					
NA8110	Instrumental Analysis (Pharmaceutical Analysis III)	0	0	4	2
	Elective for Major Project	0	0	12	4
					24

Faculty of Pharmacy
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List of Elective Subjects for Minor Project (VII Semester)

Course Code	Course Title
NA7610	Cosmetology
NA7620	Pharmaceutical Entrepreneurship
NA7630	GMP, QA & Validation
NA7640	Drug Design
NA7650	Clinical Pharmacy
NA7660	Phytoformulations

Course Code	Course Title (Practical)
NA7910	Cosmetology
NA7920	Pharmaceutical Entrepreneurship
NA7930	GMP, QA & Validation
NA7940	Drug Design
NA7950	Clinical Pharmacy
NA7960	Phytoformulations

List of Elective Subjects for Major Project (VIII Semester)

Course Code	Course Title
NA8910	Novel Drug Delivery Systems
NA8920	Pharmaceutical Marketing
NA8930	Pharmaceutical Packaging
NA8940	CADD (computer Aided Drug Design)
NA8950	Advanced Clinical Pharmacy
NA8960	Industrial Pharmacognosy

Course Code	Course Title (Practical)
NA8911	Novel Drug Delivery Systems
NA8921	Pharmaceutical Marketing
NA8931	Pharmaceutical Packaging
NA8941	CADD (computer Aided Drug Design)
NA8951	Advanced Clinical Pharmacy
NA8961	Industrial Pharmacognosy

Faculty of Pharmacy
Course Structure for B.Pharm.
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Course Title: **Pharmaceutics – I**	Course Code: **NA1010**
Credit: 3	L **3** T **0** P **0**
Year: **1st**	Semester: **I**

UNIT-I

History of Pharmacy: Origin & developments of pharmacy, scope of pharmacy and roles and responsibilities

A review of development of Pharmaceutical Education and drugs, Pharmaceutical Industry in India,

Pioneers who have contributed to the development of Pharmacy in India and Pharmaceutical legislations and ethics- a brief review.

Introduction to pharmacopoeias I.P., B.P., U.S.P. & International Pharmacopoeia.

UNIT-II

Dispensing Pharmacy:

(i) Prescriptions –Reading and understanding of prescription; Latin terms commonly used, Modern methods of prescribing.

(ii) Incompatibilities in Prescriptions –Study of various types of incompatibilities –physical, chemical and therapeutic.

(iii) Posology—Dose and Dosage of drugs, Factors influencing dose, calculation of doses for infants, adults and elderly patients; Enlarging and reducing recipies percentage solution, allegation, alcohol dilution, proof spirit, suppository bases calculation.

UNIT-III

Pharmaceutical Additives: Coloring, flavouring and sweetening agents, co-solvents, preservatives, surfactant, antioxidants.

UNIT-IV

Basic concept of dosage form and novel drug delivery system its classification, Introduction of different dosage form, its preparation and examples (solutions, aromatic waters, mixtures, spirits, syrups, elixirs, powders, lotions, liniments, pastes, mucilage, glycerin, paints, mouth washes, and inhalations)

UNIT-V

T**ABLETS**-Definition, types of tablets, advantages and disadvantages of tablets, tablets excipients, technique of granulation, single punching tablet machines, and introduction of tablet coating.

Recommended Books:

1. The science and Practice of Pharmacy by Remingtons
2. Introduction to Pharmaceutical Dosage Forms by H. C. Ansel
3. Cooper and Gunn's Dispensing for Pharmaceutical Students by S.J. Carter
4. Textbook of Professional Pharmacy by N.K. Jain and S.N. Sharma
5. Indian Pharmacopoeia, British Pharmacopoeia, United State Pharmacopoeia (Current Editions)
6. Pharmaceutical Dosage forms: Tablets, 3rd edition (Larry L. Augsburger, Stephess. V. Hoag)
7. Pharmaceutical Dosage forms: tablets (3rd volume) Herbert A.Sieberman, Leon Achman, Joseph B. Schwartx

All practicals relevant to theory

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Pharmaceutical Analysis – I**	Course Code: **NA1020**
Credit: 3	L **3** T **0** P **0**
Year: **1st**	Semester: **I**

UNIT-I

Concepts of Analysis Significance of Pharmaceutical analysis, Molarity, Molality, normality, equivalent weight, precision and accuracy, Fundamentals of volumetric analysis, primary and secondary standards, Errors, Indicators, Theory of indicators, ideal requirements of indicators

UNIT-II

Acid Base Titration: Acid-base concepts, role of solvent, Law of mass action, **common**-ion effect, ionic product of water, pH, hydrolysis of salts, neutralization curves, acid-base indicators

UNIT-III

Oxidation Reduction Titrations Oxidation and reduction, redox reactions, Theory of redox titrations, redox indicators, oxidation reduction curves, iodimetry and iodometry, titrations involving potassium iodate & potassium dichromate, Iodine, Pottasium permagnate and copper sulphate

UNIT-IV

A) Precipitation Titrations Precipitation reactions, solubility products; Argentometric titrations Mohr's method, Volhard's method and Fajan's methods.

B) Gravimetry: Precipitation techniques, Digestion, washing of the precipitate, filtration, crucibles, Ignition, Estimation barium sulphate & aluminium oxide.

UNIT-V

Complexometric Titrations-Introduction, metal ion indicators, preparation & standardization of EDTA, Estimation of Calcium carbonate,calcium gluconate & magnesium sulphate using standard EDTA

Pharmaceutical Analysis–1 Lab (NA1120)

1. Study the analytical balance and calibrate the weights provided in the weight box
2. Calibration of glass apparatus like beaker, volumetric flask ,pipette ,etc.
3. Preparation and standardize 0.1 N HCl and 0.1 N NaOH .
4. Analysis of mixture of Sodium bicarbonate and Sodium carbonate.
5. Preparation and standarisation of 0.1N pottassium permangnate ,0.1N $Na_2S_2O_3$, O.1N Silver nitrate,0.5 MEDTA, and 0.05 N iodine solution.
6. Assay of Boric acid, hydrogen peroxide, pottassium permangnate, Iodine and copper sulphate as per IP.
7. Assay of CaCO3, $MgSO_4$ and Calcium gluconate as per IP

Recommended Books:

1. Beckett. AH. and Stanlake, J.B. **Practical Pharmaceutical Chemistry**, Athilone Press, London.
2.Barner, J.D., Thomas, M.J.K., Mendham J. and Denney, R.C., Vogel's **Textbook of Quantitative Inorganic Analysis including Elementary Instrumental Analysis**. The ELBS and Longman London.
3. Gary, D.C. **Analytical Chemistry**. John Wiley and Sons, New York.
4. Alexeyev,V.,**Quantitative Analysis** . Mir Publishers, Moscow

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Pharmaceutical Chemistry-I (Inorganic Chemistry)**	Course Code: **NA1030**
Credit: 3	L **3** T **0** P **0**
Year: **1st**	Semester: **I**

UNIT -I

Sources of impurities & their control, limit test general principles and procedures of limit test for Iron, Arsenic, Lead, Heavy metals, Chloride & Sulphate. Water (Purified water, Portable water, water for injection and, sterile water for injection, Water validation and testing)

UNIT -II

Monograph – Systemic studies of Monographs, IP, BP, USP, EU, and General notices Types of monographs

UNIT- III

Definition, classification, general methods of preparation, physical and chemical properties ,Test for purity ,Assay procedure medicinal uses for the following classes of compounds(individual mentioned drugs only.

UNIT -IV

Gastrointestinal Agents:

(a) Antacids-Classification, combined antacid preparation, uses (Aluminum hydroxide, Milk of magnesia)

(b) Protective and adsorbents (Aluminium sulphate)

(c) Cathartics -Definition, classification, Saline cathartics -Disodium hydrogen phosphate)

Topical agents – (a) Antimicrobial agents-Sulphur (b) Astringents-Alum, zinc sulphate

UNIT -V

(a) Electrolytes: Physiological ions, Acid-base balance & combination therapy. ORS therapy, Electrolytes used in replacement therapy

(b) OTC drugs: Stannous Fluoride, sodium bicarbonate, sodium chloride opthalmic, simethicone, Methylcellulose

(c) Dental products: Anticaries agents, dentrifrices, and desensitising agents

Pharmaceutical Chemistry-I (Inorganic Chemistry) Lab [PHP153]

List of Experiments

1. Perform the limit test for chloride in the given sample (for e.g. Ammonium Carbonate, calcium gluconate etc,)
2. Perform the limit test for sulphate in the given sample (for e.g. Ammonium Chloride, etc)
3. Perform the limit test for iron in the given sample (for e.g. calcium carbonate)
4. Perform the limit test for heavy metal in the given sample (for e.g. Calcium carbonate)
5. Perform the limit test for arsenic in the given sample (for e.g. Barium Sulphate)
6. Preparation of Boric acid from borax and perform the limit test and identification test.
7. Preparation of potash alum by using potassium sulphate and aluminium sulphate and perform the limit test and identification test.
8. Prepare calcium Carbonate by using calcium chloride and sodium carbonate and perform the limit test and identification test.
9. Prepare heavy magnesium carbonate by using sodium carbonate and magnesium sulphate and Perform the limit test and identification test.
10. Prepare zinc sulphate by using zinc and sulphuric acid and perform the limit test and Identification test.
11. Preparation of some inorganic therapeutic compounds and it's identification and assay as per IP

Recommended Books:

1. Block, J.H. Roche, E, Soine, T and Wilson, C., Inorganic, Medicinal & Pharma. Chemistry, Lea & Febiger.
2. Discher, C.A., et.al Modern Inorganic Pharmaceutical Chemistry, Waveland press.
3. IP, BP, USP, EU (Current edition)
4. Atherden L.M., Bentley and Drivers' Text Book of Pharmaceutical Chemistry, Oxford University Press, Londan
5. Remington Pharmaceutical Sciences, Mack Publishing Co., Pennslyvannia

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Pharmacology-I (Anatomy, Physiology & Basic Pharmacology)**	Course Code: **NA1040**
Credit: 3	L: **3** T: **0** P: **0**
Year: **1st**	Semester: **I**

UNIT – I

General Pharmacology: Routes of administration, Pharmacokinetics: Absorption, distribution, metabolism (synthetic & nonsyntheic reaction) & Excretion, Bioavailability, Plasma protein binding

UNIT – II

Cell & Tissues; Cell and its components and their functions. Detailed structure of cell membrance & physiology of transport process.

Tissues of the human body: Types: epithelial, connective, muscular and nervous tissues.

UNIT – III

Skeleton & Joints: Structure, composition and functions of skeleton. Classification of joints, types of movements at joints.

Muscle: Anatomy & physiology of skeletal & smooth muscle, Physiology of muscle contraction, Action Potential.

UNIT – IV

Blood: Composition and functions of blood and its elements, erythropoiesis, blood groups and their significance. Mechanism of coagulation

Lymphatic System: Composition and function of lymph, functions of lymph node, spleen.

Urinary system: Structure and function of kidney and nephron, physiology of urine formation, micturation reflex

UNIT – V

Heart: Anatomy and function of heart, heart sound, Heart rate, cardiac output, maintenance of blood pressure, Cardiac cycle, Action Potential, ECG

Pharmacology -I (Anatomy-Physiolology & Basic Pharmacology) Lab PHP 154

List of Experiments

1. Study of Human Skeleton.
2. Study of different systems of Human body by the charts & models.
3. Microscope study of different tissues.
4. Estimation of Hemoglobin, and determination of clotting time & Bleeding time, RBC, WBC (Total), DLC & ESR.
5. Recording of body temperature, pulse rate and blood pressure, Electrocardiogram- PQRST waves and their significance.
6. Determination of vital capacity & lung capacity.

Reference Book:

1. Tortora GJ, & Anagnodokos NP, **Principles of Anatomy & Physiology**, Harper & Rave Publishers, New Delhi.
2. Ross & Wilson, **Anatomy & Physiology in Health & Illness**, Churchill Livingstone.
3. Chatterjee C.C. **Human Physiolog**y, Medical Allied Agency, Calcutta
4. Guyton AC, Hall JE., **Text book of Medical Physiology**, WB Saunders Company.
5. Keele, C.A., Niel, E and Joels N, Samson Wright's **Applied Physiology**, Oxford University Press

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Applied Mathematics**	Course Code: **JA1060**
Credit: 3	L **3** T **0** P **0**
Year: **1st**	Semester: **I**

UNIT-I

Algebra: Equations reducible to quadratics, simultaneous equations (linear and quadratic), Determinants, properties of solution of simultaneous equations by Cramer's rule.

UNIT-II

Matrices, definition of special kinds of matrices, arithmetic operations on matrices, inverse of a matrix, solution of simultaneous equations by matrices, pharmaceutical applications of determinants and matrices. Mensuration and its pharmaceutical applications

UNIT-III

Condensation of the data collected; various forms of distribution tables.

ictorial representation of frequency distribution in histograms and frequency polygons . Measures of central tendency.

Measures of dispersion-range, mean deviation and standard deviation, coefficient of variation.

UNIT-IV

Graphical representation of data, use of log log graph, semi log graph etc.

UNIT-V

Trigonometry: Measurement of angle, T-ration, addition, substraction and transformation formulae, T-ration of multiple, submultiples, allied and certain angles, application of logarithms in pharmaceutical computations.

Recommended Books:

1. A textbook of Mathematics for XI-XII Students, NCERT Publication Vol. I-IV..
2. Loney, S.L, **The elements of coordinate geometry** AITBS Publishers.
3. Gupta S.P**., Statistical Methods** Sultan Chand and Co., New Delhi
4. Narayan Shanti**, Integral calculus**, Sultan Chand & Co.
5. Prasad Gorakh,**Text book on differential calculus**, Pothishala Pvt. Ltd., Allahabad.
6. Prasad Gorakh, **Text book on integral calculus** , Pothishala Pvt. Ltd., Allahabad.
7. Narayan Shanti, **Differential calculus**, Shyamlal Charitable Trust, New Delhi.
8. Vishal Mehta, **Remedial Mathematics for Pharmacy**, Kamini Publication, Kanpur
9. Loney, S.L, **Plane Trigonometry** AITBS Publishers

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Applied Biology**	Course Code: **NA1050**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **I**

UNIT-I

Plant cell: Cell organelles, cell cycle, cell division (mitosis and meiosis), Plant tissue and tissue system.

UNIT-II

Study of morphological and histological characters of crude drugs:
Ergastic cell inclusions, anatomical structures of bark, fruits, flowers, seeds and monocot and dicot stems, leaves and roots.

UNIT-III

Nomenclature and Methods of plant classification: Artificial system, Phylogenetic system, Natural system and Modern system

UNIT-IV

Plant taxonomy:
Study of medicinally important families: Apocynaceae, Solanaceae, Rutaceae, Umbeliferae, Leguminosae, Rubiaceae, Liliaceae, Gramineae, Labiateae, Cruciferae, Papaveraceae, Compositae.

UNIT-V

Factors affecting plant cultivation and their growth:
(i) Exogenous (ii) Edaphic factors (iii) Mineral supplements
(iv) Nutrients (v) Growth regulators and inhibitors

Recommended Books:

1. Dutta A.C. **Botany for Degree students** Oxford University Press, New Delhi
2. Marshall & Williams **Text Book of Zoology** CBS Publishers & Distrubutors, Delhi.
3. Weiz, Paul B **Laboratory Manual in Science of Biology** Mc Graw-Hill Book Company.
4. Fahn **Plant Anatomy** Aditya Books Private Limited, New Delhi.

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Professional Communication - I**	Course Code: **HA1210**
Credit: 3.5	L **3** T **0** P **1**
Year: **1st**	Semester: **I**

UNIT – I

1. Communication: Definition and Process of Communication.
2. Types of Communication: Formal and Informal Communication, Verbal and Non-Verbal Communication.
3. Barriers to Communication: Intrapersonal and Interpersonal Barriers. Semantic Barriers, Physical Barriers, Psychological Barriers, and Organizational Barriers.

UNIT – II

1. Importance and Objective of Listening Skills, Process of Listening, Listening and Hearing, Types of Listening, and Methods for Improving Listening Skills.
2. Listening Comprehension: Identifying General and Specific Information.
3. Listening for Note taking and drawing Inferences.
4. Importance of Speaking Skills, Types of Speaking, Methods for Improving Speaking Skills
5. Introduction to Phonetic Transcription: Familiarization with British and American Usage

UNIT – III

1. Importance of Reading Skills, Types of Reading Skills, Methods of Improving Reading Skills.
2. Vocabulary Building: Antonyms, Synonyms, Homophones, Homonyms, and One-Word Substitution, Etymology and roots.

UNIT – IV

1. Importance of Writing Skills, Types of Writing Skills, and Methods for Improving Writing Skills.
2. Sentence and Paragraph Construction. Writing Expository, Argumentative, and Deductive Order etc Paragraphs.
3. Précis Writing
4. Basic Letter Writing: Format and Style of Formal Letters.

UNIT – V

ONE ACT PLAY

Practice of LRSW through the study of the one act play, ***THE REFUND*** by **Fritz Karinthy**.

Text Books:

1. Gupta, Ruby. Basic Technical Communication, Cambridge University Press, New Delhi.2012.

Reference Books:

1. Rizvi, Ashraf. Effective Technical Communication, McGraw Hill, New Delhi. 2005
2. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011
3. Tyagi, Kavita & Padma Misra. Basic Technical Communication, PHI, New Delhi. 2011
4. Lewis, Norman. Word Power Made Easy, W.R Goyal Pub. & Distributors.1995
5. Ford A, Ruther. Basic Communication Skills; Pearson Education, New Delhi.2013
6. Aslam, Mohammad. Introduction of English Phonetics and Phonology Cambridge.2003
7. Kameswari, Y. Successful Career Soft Skills and Business English, BS Publications, Hyderabad. 2010
8. English Pronouncing Dictionary, Cambridge.2012
9. The Oxford Guide to Writing and Speaking. OUP, Delhi.2011

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Physical Pharmaceutics – I (Pharmaceutics-II)**	Course Code: **NA2010**
Credit: 3	L **3** T **0** P **0**
Year: **1st**	Semester: **II**

UNIT – I

Solubility And Distribution Phenomenon: solute – solvent interactions, solubility of gases in liquids, solubility of liquids in liquids, solubility of solids in liquids, factors affecting solubility. solubilization mechanism and techniques.

UNIT – II

Buffers equations and buffer capacity in general buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions measurements of tonicity, calculations and methods of adjusting isotonicity, sublimation, eutectic mixtures, liquid crystals, glassy state, solids crystalline, amorphous and polymorphism

UNIT – III

Solutions: Ideal and real solutions, distribution law, solutions of gases in liquids, Osmosis and Reverse Osmosis, partition coefficient, Debye Huckel theory, Dielectric Constant, Solute Solvent Interactio**n.**

UNIT – IV

Chemical Kinetics: Zero, first and second order reactions, complex reactions, theories of reaction kinetics, characteristics of homogeneous and heterogeneous catalysis, acid base and enzyme catalysis.

UNIT – V

Micromeretics And Powder Rheology: Average particle size, Particle size distribution, number and weight distribution, particle number; methods for determining particle size – optical microscopy, sieving, sedimentation , particle volume measurement , shape, specific surface; methods for determining surface area- air permeability, adsorption; derived properties of powders- porosity, packing arrangement, densities, bulkiness and flow properties, pore size

All Practicals relevant to theory.

Recommended Books:

1. Physical Pharmacy by Alfred Martin.
2. Bentley's Textbook of Pharmaceutics by E.A. Rawlins.
3. Remington's Pharmaceutical Sciences.
4. Physical Pharmaceutics by E. Shotton

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Pharmaceutical Organic Chemistry–I (Pharmachemistry-II)**	Course Code: **NA2020**
Credit: 3	L **3** T **0** P **0**
Year: **1st**	Semester: **II**

UNIT-I

Atomic Structure, atomic orbital, molecular orbital, hybridization, sigma and Pi bond, covalent, electrovalent and co-ordinate bond, inductive effect, resonance, Classification and Nomenclature of organic compounds.

UNIT-II

Methods of preparation, reactions with special reference to mechanism of the following classes of compounds: chlorofluorocarbons and ozone layer. **Alkenes**, **and dienes** ,Diels Alder reaction.

UNIT-III

Methods of preparation, reactions and pharmaceutical application s with special reference to mechanism of the following classes of compounds: Alkyl Halides& Aryl halides, SN1 and SN2 reactions & Nucleophilic aromatic substitution, Elimination reactions. Alcohols & Phenols, Fries rearrangement, Willliamson's reaction.

UNIT - IV

Aromatic Compounds, aromatic nature, structure of benzene, resonance, Aromatic electrophilic substitution reactions- mechanisms of nitration, halogenation, sulphonation, Friedal-Crafts reaction.

Activating and deactivating substituents, orientation and reactivity.

Arenes. Amines (aliphatic & aromatic), Hofmanns, Beckmanns, Smith reactions. Diazotisation and Diazonium salts. Diazocoupling reactions and Pharmaceutical applications. Basicity of amines, Effect of substituents on basicity

UNIT-V

Aldehydes and ketones (aliphatic & aromatic), Nucleophilic additions in aldehydes and ketones, mechanisms with examples, aldol condensation reaction, crossed aldol condensation reaction, benzoin's, perkins, knoevenagels and reformatsky reaction, Wolf-Kishner reduction, Clemensen reduction

Carboxylic acids & their derivatives, di & tricarboxylic acids, hydroxy acids. Organometallic Compounds- Grignard reagent, organo-lithium compounds, their preparation &synthetic and pharmaceutical applications

List of Experiments (PHP252)

1. Identification of elements and functional groups in given organic compounds.
2. Purification of solvents like Toluene Chloroform, Acetone and preparation of absolute Alcohol.
3. Synthesis of compound s involving benzoylation and acetylation.(any3)
4. Synthesis of Picric acid, Aniline, Acetanilide, Aspirin, Hippuric acid, p- Bromo acetanilide, Iodoform and Oxalic acid.

Recommended Books:

1. Finar, I.L., Organic Chemistry, Vol. I & II, ELBS/Longman.
2. Vogel A.I., Textbook of Practical Organic Chemistry, ELBS/Longman.
3. Morrison, R.T., and Boyd R.N., Organic Chemistry, Prentice Hall of India Pvt. Ltd, New Delhi.
4. Mann, F.G, & Saunders, B.C., Practical Organic Chemistry, ELBS/ Longman
5. Hendrikson, Organic Chemistry.
6. Godly, E.W. Naming organic compounds

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Pharmacognosy – I**	Course Code: **NA2030**
Credit: 3	L **3** T **0** P **0**
Year: **1st**	Semester: **II**

UNIT-I

Introduction: Historical development, modern concept and scope of Pharmacognosy. Significance of Pharmacognosy in various systems of medicine *viz*; Ayurveda, Unani, Homeopathic, Siddha and Allopathic systems practiced in India

UNIT-II

Sources & classification of herbal drugs: Based on alphabetical, morphological, pharmacological, chemical, chemo taxonomical and taxonomical methods, organized and unorganized drugs. Sources of crude drugs viz; Herbs, Animals, inorganic matter, plant tissue culture and marine sources

UNIT-III

a. Methodology of cultivation(GCPM : Good cultivation practices for medicinal plants) of crude drugs in detail, collection, processing & storage of crude drugs.

b. Plant Hormones, their applications, Pest and classification of pesticides. Pest management and natural pesticides

UNIT-IV

Systematic monograph: (Ayurvedic terminology) Ayurvedic pharmacopoeia, Indian herbal Pharmacopoeia, US Herbal Pharmacopoeia, Ayurvedic formulary of India.

UNIT-V

Systematic Pharmacognostic study of the unorganized crude drugs:

Carbohydrates and derived products: Acacia, Tragacanth, Isapgol, Pectin, Guar gum, Gum, Starch, Sodium Alginate, Chitin, Agar

List of Experiments (PHP254)

1.Microscope and Microscopic preparation: Section cutting, Staining, mounting and surface preparation.

2. Microscopical identification techniques for: Basic tissues of barks, stems, root, leaf, flowers, fruits, seeds of monocots and dicots. Trichomes, stomata, calcium oxalate crystals, starch, phloem fibers.

3. Chemical identification: General chemical tests for alkaloids, glycosides, tannins, resins and proteins**.**

Recommended Books:

1. Kokate, C.K. Practical Pharmacognosy, Vallabh Prakashan, Delhi.
2. Wallis T.E. Analytical Microscopy, J&A Churchill Ltd, London.
3. Clarke ECG, Isolation & Identification of drugs. The Pharmaceutical Press, London.
4. Trease, G.E. & Evans, W.C. "Pharmacognosy" Bailliere Tindall East Bourne, U.K.
5. Tyler V.E. etal, Pharmacognosy, Lea & Febiger Phjadelphia.
6. Wallis T.E. Text book of Pharmacognosy" J&A Churchill Ltd. London.
7. Kokate, C.K. etal, Pharmacognosy" Nirali Prakashan, Pune.
8. Atal & Kapur, Cultivation & Utilization of Medicinal Plants, RRL, Jammu.
9. Stahl. E, Thin Layer Chromatography. A laboratory handbook, Springer Verlog, Berlin.
10. Henry TA. The Plant Alkaloids, McGraw Hill, New York.

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Pharmacology – II (Anatomy, Physiology and Basic Pharmacology-II)**	Course Code: **NA2040**
Credit: 3	L: **3** T: **0** P: **0**
Year: **1st**	Semester: **II**

UNIT -I

Central Nervous System: Anatomy & Functions of different parts of brain and spinal card. Nerve Histology, Cranial nerves and their functions. reflex action, electroencephalogram

UNIT -II

Autonomic Nervous System: Anatomy, Physiology and functions of the autonomic nervous system. Mechanism of neurohumoral transmission in ANS.

UNIT -III

Respiratory System: Anatomy & functions of respiratory organs, Mechanism and regulation of respiration, Oxygen and Carbon Dioxide Transport in the Blood

Gastro-intestinal tract: Structure, functions, secretion and their role in the digestion and absorption including liver, gall bladder etc.

UNIT -IV

Endocrine System: Basic anatomy and physiology of Pituitary, Thyroid, Parathyroid, Adrenal, Pancreas, their hormones and functions

UNIT -V

Pharmacodynamic: Principles of of drug action, Mechanisms of drug action, Receptors, combined effect of drugs, factors modifying drug action

Recommended Books:

1. Tortora GJ, & Derrickson BH, **Principles of Anatomy & Physiology**, John Wiley & Sons, Inc. Current Edition
2. Ross & Wilson, **Anatomy & Physiology in Health & Illness**, Churchill Livingstone. Current Edition
3. Chatterjee C.C. **Human Physiolog**y, Medical Allied Agency, Current Edition
4. Guyton AC, Hall JE., **Text book of Medical Physiology**, WB Saunders Company. Current Edition
5. Keele, C.A., Niel, E and Joels N, Samson Wright's **Applied Physiology**, Oxford University Press. Current Edition
6. Goodman & Gilman, The Pharmacological basis of Therapeutics, McGraw Hill Pub Co., Current Edition
7. Turley, Understandig pharmacology, 3ed, ed, Pearson educations, Current Edition
8. Tripathi, K.D. Essentials of Medical Pharmacology, Jay Pee Publishers, New Delhi. Current Edition
9. Satoskar & Bhandarkar; Pharmacology & Pharmacotheropeutics., Popular Prakashan Pvt. Ltd. Bombay. Current Edition

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Professional Communication – II**	Course Code: **HA2210**
Credit: 3.5	L **3** T **0** P **1**
Year: **1st**	Semester: **II**

Course Title: **Physical Pharmaceutics – II (Pharmaceutics-III)**	Course Code: **NA3010**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III**

UNIT -I

RHEOLOGY: Newtonian systems-Newton's Law, kinematics viscosity, effect of temperature; non-Newtonian systems- plastic ,pseudo plastic, dilatant; thixotropy- thixotropy in formulation; determination of viscosity-choice of viscometer, capillary, falling sphere, cup & bob, plate & cone viscometers, application of rheology in pharmacy

UNIT –II

SURFACE AND INTERFACIAL PHENOMENON : Liquid interface, surface and interfacial tensions, surface free energy, measurement of surface and interfacial tensions (capillary rise method, drop number method, drop weight method, Wilhelm plate method), spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB classification, detergency, adsorption at solid interfaces, solid gas and solid-liquid interfaces, complex films, electrical properties of interface

UNIT-III

COLLOIDAL DISPERSIONS: Definition, types, properties of colloids-optical, kinetics, electrical; protective colloids, applications of colloids in pharmacy

UNIT –IV

SUSPENSIONS: Interfacial properties of suspended particles, settling in suspensions- theory of Sedimentation, effect of Brownian movement, sedimentation of flocculated particles, sedimentation Parameters; wetting of particles, controlled flocculation, flocculation in structured vehicles, rheological considerations, stability.

EMULSIONS: Types, theories of emulsification, physical stability, preservation, rheological properties, pharmaceutical applications of emulsions, micro and multiple emulsions.

UNIT-V

STABILITY: Decomposition of medicinal agents- Influence of light, temperature and medium, half life, shelf life; stabilization of medicinal agents, accelerated stability and stress testing, ICH guidelines.

Recommended Books:

1. Physical Pharmacy by Alfred Martin.
2. Bentley's Textbook of Pharmaceutics by E.A. Rawlins.
3. Remington's Pharmaceutical Sciences.
4. Physical Pharmaceutics by E. Shotton

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

List of Experiments (NA3110)

1. Surface Tension:
    (a) Determination of surface tension of given liquid
    (b) Determination of critical micelle concentration of a surfactant by stalagmometer.
2. Determination of HLB of Glyceryl Monostearate
3. Determination of Specific Surface area of charcoal by adsorption method.
4. Viscosity:
    (a) Determination of viscosity of given liquid
    (b) Determination of composition of binary mixture by viscosity method.
5. Phase Rule
    (a) Determination of Critical solution temperature of Phenol water system
    (b) Determination of plate point of three-component system
6. Distribution co-efficient:
    (a) Determination of partition coefficient of iodine between carbon tetrachloride and water
    (b) Determination of partition coefficient of benzoic acid between water and benzene
7. Determination of particle size distribution of any material by
    (a) (i) Sieve analysis (ii) Microscopy (iii) Optical Microcopy
    (b) Determination of particle size by sedimentation method using and Andreason pipette.
8. Viscosity determination of Newtonian and Non-Newtonian liquids by one point and multipoint viscometers.
9. Determination of HLB value of surfactant by saponification method.
10. Determination of HLB value by modified Griffin acacia emulsion method.
11. Design, conduction and reporting of accelerated testing in studying chemical stabilization against hydrolytic decomposition of drugs.

Any other new experiment that can be included from time to time in support of the theoretical aspects of the course.

Recommended Books:

1. Martin: Physical Pharmacy, K.M.B. Varghese Co. Bombay.
2. A.T. Florence and D. Attwood W: Physiochemical principles of Pharmacy.
3. Shotton and Ridgeway: Physical Pharmaceutics.
4. Remingtons Pharmaceutical Sciences, Mark Publishing Co.
5. H.S. Beans, A.H. Beckett and J.E. Carless: Advances in Pharmaceutical Sciences, Vol. 1 to 4

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Pharmaceutical Organic Chemistry – II** **(Pharmaceutical Chemistry – III)**				Course Code: **NA3020**
Credit: 3	L	T	P	
	3	**0**	**0**	
Year: **2nd**				Semester: **III**

UNIT – 1

Methods Of Preparation With Mechanism, Properties And Mechanism Of name Reaction Associated With: -

(I) Active Methylene Compounds (Acetoacetic Ester And Malonic Ester) & their synthetic importance.
(II) α, ß-Unsaturated Carbonyl Compounds.
(III) Polynuclear Hydrocarbons – Napthalene, Anthracene & Phenantherene.

UNIT – 2

Nomenclature, Chemistry, preparation, properties and examples of 6-membered heterocycles with one hetero atom (Pyridine, Pyran),6-membered heterocycles with two hetero atoms (Pyrimidine, Piperazine) Benz fused heterocycles (Quinoline, Isoquinoline, Indole)

UNIT – 3

Stereochemistry: -Isomerism, Chirality, nomenclature, optical activity, Racemic modification, stereoisomerism, specification, Configuration, Bayer strain theory, ring strain, conformational analysis of cyclohexane and butane and its pharmaceutical applications

UNIT – 4

Heterocyclic Compounds: Nomenclature, Chemistry, preparation, properties and examples of medicinal compounds contaning- 5-membered heterocycles with one hetero atom (Pyrrole, Furan and Thiophene), 5-membered heterocycles with two hetero atom (Imidazole, Thiazole, Oxazole, Pyrazole) and its pharmaceutical applications

UNIT – 5

Polymers and biopolymer-Classification, Synthesis, reactions, crystallinity, polymer degradation mechanism, copolymerization and their pharmaceutical applications in Pharmacy.

Pharmaceutical Organic Chemistry – II (NA3120)

List of Experiments

Identification of organic compound with derivatisation. Synthesis of organic compounds involving Oxidation, Reduction, Rearrangement, Substitution, Condensation, Diazotization reactions**. polymers identification and characterization and synthesis of semi-synthetic polymer.**

Recommended Books:

1. E.L. Eliel Stereochemistry of carbon compounds, Tata McGra Hill Publishing Company New Delhi
2. Jerry March, Advance organic Chemistry 4th ed.. A Wiley-Interscience Publication,
3. I.L. Finar's Organic chemistry,
4. Mann P G & Saunders B C, Practical Organic Chemistry, ELBS/Longman, London.
5. Furniss B A, Hannaford A J, Smith P W G and Tatehell A R, Vogel's Textbook of Practical Organic Chemistry, The ELBS/ Longman, London.
6. Polymer Science, V.R.Gowarikar, N.V.Vishwanathan, Jayadev Sreedhar, New Age International, New Delhi

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Pharmacognosy – II (Pharmacognosy & Phytochemistry)**	Course Code: **NA3030**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III**

UNIT-I

Quality control of crude drugs: Adulteration types and causes, Evaluation of drugs by organoleptic, microscopic, physical, chemical and biological methods**.**

UNIT-II

Trade & commerce in herbal drugs: Indian and International trade in aromatic and Medicinal plants. Plants based industries and research institutes. Regulation pertaining to trade drugs**.**

UNIT-III

WHO guideline for standardization of crude drugs: Extractive values, ash values, chromatographic techniques (TLC, HPTLC and HPLC) for determination of chromatographic markers, spectroscopic techniques and assay methods. Determination of heavy metals in herbal preparation and alcohol contents in Aristas and bhasams.

UNIT-IV

Alkaloids: Systematic study of source, cultivation, collection, processing, commercial varieties, chemical constituents, substitute's adulterants, uses, diagnostic macroscopic & microscopic features & specific chemical tests of following alkaloid containing drugs.

(a) Pyridine- piperidine : Tobacco, Areca & Lobelia.
(b) Tropane : Belladona, Hyoscyamus, Datura, Coca & Withania.
(c) Quinoline & Isoquinoline: Cinchona, Ipecac & Opium.
(d) Indole: Ergot, Rauwolfia, Catharanthus & Nux-vomica. (e) Imidazole: Pilocarpus.
(f) Steroidal: Veratrum & Kurchi. (g) Alkaloidal amine: Ephedra & Colchicum.
(h) Glycoalkaloid: Solanum. (i) Purines: Coffee & Tea (j) Quinazoline: Vasaka

UNIT-V

Glycosides: Study of the biological sources, cultivation, collection, Commercial varieties, chemical constituents, substitutes, adulterants, uses, diagnostic macroscopic and microscopic features and specific chemical tests of following groups of drugs containing glycoside:

(i) Saponins: Liquorice, Ginseng, Dioscorea.
(ii) Cardioactive sterols: Digitals, Squill, Stropanthus & Thevetia.
(iii) Anthraquinone glycosides: Aloe, Senna, Rhubarb & Cascara**.**

List of Experiments (NA3130)

1. Identification of crude drugs listed above.
2. Macroscopic and Microscopic study of some drugs mentioned in theory.
3. Chemical evaluation of powdered drugs.
4. Chromatographic studies of some main Phytochemical constituents.
5. Standardization parameters for crude herbal drugs.
6. Microscopical studies of basic tissues, bark, stem (Dicot, monocot), Root (Dicot, Monocot), seed, leaf, fruits, trichomes, stomata, calcium oxalate crystals, starch, phloem fibres.

Recommended Books:

1. T.E.Wallis: "Text Book of Pharmacognosy", 5th edition, CBS Publishers & Distributors Pvt. Ltd., 2005.
2. W.C.Evans: "Trease and Evans Pharmacognosy", 15th edition, Saunders, Elsevier, 2007.
3. C.K. Kokate, A. P. Purohit & S. B. Gokhale: "Pharmacognosy", 41st edition, Nirali Prakashan, 2008.
4. J. S. Quadry: "Shah & Qadery Pharmacognosy", 14th edition, B. S. Saha Prakashan, 2009.
5. Ashutosh Kar: "Pharmacognosy and Pharmacobiotechnology", 2nd edition, New Age International, 2007

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Pharmacology – III (Pathophysiology & Pharmacology-I)**	Course Code: **NA3040**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III**

UNIT-I

Cell pathology: Causes of Cell injury, pathogenesis, and morphology of cell injury, adaptations, cellular aging and cell death (necrosis, apoptosis).

UNIT-II

Pathology of Inflammation and wound healing: Vascular and cellular events of acute inflammation, chemical mediators of inflammation, pathogenesis of chronic inflammation, brief outline of the process of repair and wound healing.

UNIT-III

Pathology of CVS Diseases: Hypertension, Atherosclerosis, angina, myocardial infarction, congestive heart failure and cardiac arrhythmias.

UNIT-IV

Pathology of Joint Disorder: Rheumatoid arthritis, Osteoporosis, Osteoarthritis, Gout.
GIT disorder: Peptic ulcer, Ulcerative colitis, Amoebiasis, Typhoid, Hepatitis, Cirrhosis

UNIT-V

Pharmacology: Adverse drug reactions and Drug interactions (Pharmacokinetic and pharmacodynamic), Drug dependence and tolerance, Clinical Trials (Types and Phases)

Recommended Books:

1. Textbook of Pathology Harsh Mohan Anshan Pub. Current Edition
2. Robbins Basic Pathology Vinay Kumar, M.D., Abul K. Abbas, Jon C. Aster Elsevier Health Sciences, Current Edition
3. Pathophysiology: The Biologic Basis for Disease in Adults And Children, Kathryn L. McCance, Sue E. Huether Elsevier Mosby, Current Edition
4. Pathology illustrated Peter S. Macfarlane, Robin Reid, Robin Callander, Alasdair D.T. Govan Churchill Livingstone, Current Edition
5. Pathology- Alan Stevens (MRCPath.), Alan Stevens, James Steven Lowe Mosby, Current Edition
6. Goodman & Gilman, The Pharmacological basis of Therapeutics, McGraw Hill Pub Co., Current Edition
7. Turley, Understandig pharmacology, 3ed, ed, Pearson educations, Current Edition
8. Tripathi, K.D. Essentials of Medical Pharmacology, Jay Pee Publishers, New Delhi. Current Edition
9. Satoskar & Bhandarkar; Pharmacology & Pharmacotheropeutics., Popular Prakashan Pvt. Ltd. Bombay. Current Edition

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Manufacturing Operation – I (Pharmaceutics–IV)**	Course Code: **NA3050**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III**

UNIT -I

Stoichiometry : Unit processes material ,concepts and role of QbD in equipment selection of and energy balances, molecular units, mole fraction, gas laws, mole volume, primary and secondary quantities, equilibrium state, rate process, steady and unsteady states, dimensionless equations, dimensionless formulae, dimensionless groups. Mechanism of Fluid flow, Significance of Reynolds Number, Distribution of Velocities across the Tube, Mass Transfer, Solid / Fluid Mass Transfer, Application in Unit Operation.

UNIT –II

Size Reduction: Objectives, Factors Affecting, Energy Requirements, Mechanisms, Methods of Size Reductions. Equipments used- Principle, material of construction, Applications, advantages and disadvantages of cutter mill, hammer mill, roller mill, ball mill, fluid energy mill**.**

Size Separation: Standards for Powders, Pharmacopoeal classification , Sieves, Materials used for sieves, Sieving Methods, Fluid Classification Methods, Sedimentation and Elutriation, Equipments used: Principle, material of construction , Applications advantages and disadvantages of cyclone, separator, sedimentation tank .

UNIT-III

Mixing Definition and objectives:- Type of Mixtures, Liquid Mixing, powder Mixing, Semisolids, mixing equipment: Principle, material of construction, Applications advantages and disadvantages of shaker mixer, propeller mixer, turbine mixer ,paddle mixer, planetary mixer, double cone mixer, V mixer, sigma mixer and colloid mill, ultrasonic mixer

UNIT-IV

Drying: Drying Mechanism of drying, Rate of drying & time of drying calculations, Principle , material of construction, applications advantages and disadvantages of tray , fluidized bed , Rotary Drum , Vacuum ,Spray and Freeze dryer

UNIT –V

Filtration:- Factors Affecting, Rate of Filtration, Properties of the filter medium and filter cake, Mechanism of Filtration, Filter Media and aids, Principle, material of construction Applications advantages and disadvantages of Industrial Filters, Filter Leaf, Filter Press, Rotary Filter.

Centrifugation:- principle, factor affecting , Principle, material of construction , Applications, advantages and disadvantages of perforated basket centrifuge , tubular bowl centrifuge conical disc centrifuge, ultra centrifuge.

List of Experiments (NA3140)

1. Study the Effect of different filter media on rate of filtration
2. Study the Effect of viscosity of filtrate on rate of filtration
3. Study the Effect of pressure on rate of filtration
4. Study the Effect of thickness of cake on rate of filtration
5. Study the Effect of filter aids on rate of filtration.
6. Study principle of centrifugation for Liquid –Liquid separation and stability of emulsions.
7. Study principle of centrifugation for Solid – liquid separation and stability of suspension.
8. Experiments to illustrate principles of size reduction using Ball Mill. Effect of size of balls, number of balls and time on the efficiency of ball mill.
9. Experiments to illustrate mixing efficiency Solid-Solid mixing.
10. Particle size analysis by sieving and microscopy.
11. To Determine the Effect of Surface Area for Rate of Drying
12. Experiments using Reynolds no venture and orifice meter

Recommended Books:

1. Badger W.L. and Banchero J.T. Introduction to Chemical Engineering; McGraw Hill International Book Co., London.
2. Perry R.H. & Chilton C.H. Chemical Engineers Handbook, McGraw Kogakusha Ltd.
3. McCabe W.L. and Smith J.C. Unit Operation of Chemical Engineering, McGraw Hill International Book Co., London.
4. Sambhamurthy, Pharmaceutical Engineering, New Age Publishers.
5. Gavhane, K.A. Unit Operation-I, Nirali Prakashan.
6. Cooper and Gunn's Tutorial Pharmacy, CBS Publishers, New Delhi

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Pharmaceutical Biotechnology & Microbiology**	Course Code: **NA4010**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **IV**

UNIT -I

Microscopy - Structure of Bacterial Cell, Classification of Bacteria, Fungi, Virus. Electron Microscope, Stains - types of staining techniques and chemical Tests, Culture media and their classification, measurement of microbial growth, Isolation of Virus

UNIT –II

Disinfection, factors influencing disinfectants, dynamics of disinfection, Phenol Coefficient Tests, Sterilisation Methods, Validation of Sterilisation Methods and Equipments

UNIT-III

Immunology - Antigens, Different types of Antibodies, B Cell, T cell, Haptens and their properties, Hypersensitivity, Auto Immune Diseases, Immuno deficient Disorders, Applications of Antigen Antibody Reactions, Complementary System, MHC, APC, AIDS, Application of MonoClonal Antibodies

UNIT-IV

GLP in Microbiology Laboratory, Sterility Testing as per IP, Preservative Efficacy as per IP.

UNIT –V

Vaccines and Sera :- Classification, Production, Assay, Storage of important Bacterial and viral vaccines like DPT Vaccine and antitoxin, Mumps, Polio, Rubella, Influenza, Typhoid, Polysaccharide vaccines

List of Experiments (NA4110)

1. Various staining methods
2. Experiments designed to prepare various types of culture media sub-culturing of common aerobic and anaerobic bacteria, fungus and yeast
3. Various methods of isolation and identification of microbes
4. Sterilization techniques and their validation, validation of sterilization techniques
5. Evaluation of antiseptics and disinfectants
6. Testing the sterility of pharmaceutical products as per I.P. requirements
7. Microbial assay of antibiotics and vitamin
8. Experiments on Preservative efficacy
9. Microbiological testing of non-sterile products.
10. Isolation of DNA, Gel Electrophoresis of Proteins

Text books:

1. Stanier R.Y., Ingraham, J.L., Wheelis M.L. & Painter P.R. General Microbiology, Macmillan Press Ltd.
2. Tortora, Microbiology An Introduction, Pearson education
3. Glazer,"Microbial Biotechnology' Cambridge Univ. Press
4. Pelczar & Reid, Microbiology, Tata Mc Graw Hill, Delhi.
5. Ananthanarayan R & Paniker CKJ, Textbook of Microbiology, Orient Longman.
6. Gunasekaran P, Lab Mannual of Microbiology, New Age Publishers.
7. Latest edition of USP, BP, IP

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Pharmaceutical Analysis – II**	Course Code: **NA4020**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **IV**

Theoretical considerations and application in drug analysis and quality control by the following analytical techniques (assays included in the Current edition of Indian Pharmacopeia, British Pharmacopoeia).

UNIT –I

A. Non-aqueous titration
B. Diazotisation titrations
C. Complexometric Titrations

UNIT –II

Karl-Fischer titration, Oxygen flask combustion, Kjeldahl method of nitrogen estimation.

UNIT-III

Principle, Instrumentation and Applications of: Potentiometry, Conductometry, An Introduction of principle instrumentation of Polarography & Amperometry. Electrophoresis (paper, gel and capillary).

UNIT-IV

Theory, Instrumentation and Applications of: Atomic absorption spectroscopy, Flame Photometry.

UNIT-V

Pharmacopoeial Standards: Chemical methods

List of Experiments (NA4120)

1. Non-aqueous titrations: Preparation and standardization of perchloric acid.
2. Analysis of pharmacopoeial drugs and dosage forms(five each).
3. Practical based on paper, column and thin- layer chromatography and gel electrophoresis.
4. Practical involving diazotization, Karl-Fischer methods.
5. Determination of Sodium, Potassium and Calcium ion by Flame Photometry

Recommended Books:

1. Beckett, A H and Stenlake, J.B, Practical Pharmaceutical Chemistry, Vol I and II, The Athlone Press of the University of London.
2. IP, BP
3. Mendham J. Denny RC Barnes, J.D. Thomas M.J.K. "Vogel's Text Book of Quantitative Chemical Analysis" Pearson Education Asia.
4. Connors KA, A text book of Pharmaceutical Analysis, Wiley Intescience, New York

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Bulk Drug Production (Pharmaceutical Chemistry-IV)**	Course Code: **NA4030**		
Credit: 3	L **3**	T **0**	P **0**
Year: **2nd**	Semester: **IV**		

UNIT – 1

Introduction to bulk drugs ,Equipments and techniques Involved in bulk drug synthesis and production

UNIT – 2

Basic concept involved in Quality by Design and it's significance in bulk drugs production

UNIT – 3

Basic instruments used for bulk drug synthesis with construction, working, SOP, and it's validation

UNIT – 4

Bulk drug production of API 'S (Any five) and their monographic analysis

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Pharmacology – IV (Pathophysiology & Pharmacology-II)**	Course Code: **NA4040**		
Credit: 3	L **3**	T **0**	P **0**
Year: **2nd**	Semester: **IV**		

UNIT – 1

Pathology of Immune Disorder: Hypersensitivity, AIDS, Autoimmune disease

Respiratory Problem: Asthma, Bronchitis, Emphysema, Pneumonia, Tuberculosis

UNIT – 2

Endocrine Disease: Diabetes mellitus, Diabetic ketoacidosis and Thyroid disorders.

Kidney Disorder: Acute and chronic renal failure, Renal stones

UNIT – 3

Pathology of Nervous System Disorder: Trigeminal neuralgia, Myasthenia Gravis, Epilepsy, Parkinsonism, Schizophrenia, Alzheimer's Disease

UNIT – 4

Pathology of Neoplasia: Neoplastic proliferation, neoplasm – classification, spread of carcinoma, types of carcinoma, carcinogenesis.

Blood and Circulatory Disorder: Anemia, Leukaemia, Thrombosis, Embolism

UNIT – 5

Pharmacology- Autacoids:

Histamine and antihistaminics, Serotonin (5-HT), receptors and their antagonists, Migraine and its treatment

Recommended Books:

1. Textbook of Pathology; Harsh Mohan; Anshan Pub.
2. Robbins Basic Pathology; Vinay Kumar, M.D., Abul K. Abbas, Jon C. Aster; Elsevier Health Sciences
3. Pathophysiology: The Biologic Basis for Disease in Adults And Children; Kathryn L. McCance, Sue E. Huether; Elsevier Mosby,
4. Pathology Illustrated; Peter S. Macfarlane, Robin Reid, Robin Callander, Alasdair D.T. Govan Churchill Livingstone,
5. Pathology; Alan Stevens (MRCPath.), Alan Stevens, James Steven Lowe Mosby,
6. Goodman & Gilman, The Pharmacological basis of Therapeutics, McGraw Hill Pub Co.,
7. Turley, Understandig Pharmacology; 3rd ed, Pearson Educations
8. Tripathi, K.D.; Essentials of Medical Pharmacology; Jay Pee Publishers, New Delhi.
9. Satoskar & Bhandarkar; Pharmacology & Pharmacotheropeutics; Popular Prakashan Pvt. Ltd. Bombay

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Manufacturing Operation – II (Pharmaceutics-V)**	Course Code: **NA4050**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **IV**

UNIT-I

Evaporation: Basic concepts of phase equilibrium, Factors affecting evaporation, principle, materials of construction, Applications, advantages and disadvantages of Climbing and falling film, evaporators , Evaporating pan , Vacuum evaporators, Horizontal and Vertical evaporators.

UNIT-II

Distillation: Raoult's law, Phase diagrams, Simple, Steam, & Flash distillation, Principle of McCabe Thiele"s method of calculation of number of theoretical plates, Equipment for rectification,Azeotropic, Extractive & molecular distillation **.**

UNIT-III

Crystallization: Characteristics of Crystals- purity, size, shape, geometry, habit, forms and factors affecting them. Miers super-saturation theory & caking of crystals and its prevention Classification of crystallizers, Principle, Materials of construction, applications, advantages and disadvantages of Swenson Walker, Agitated batch, Vacuum, Tank and Krystal Crystallizer

UNIT-IV

Humidity, Ventilation And Air Conditioning Systems (Hvac): Basic concepts & definitions, Wet bulb & Dry bulb thermometer, adiabatic saturation temperature, Psychometric charts & Measurement of humidity, Application of humidity measurement in pharmacy, Equipment and area validation for dehumidification operations. Principles, Materials of constructions and Applications of Refrigeration and Air-conditioning.

UNIT-V

Machinery used for the packaging of dosage form, and its selection criteria for Conveying of Solids Belt conveyors, chain conveyors, screw conveyors and pneumatic conveyors.

List of Experiments (NA4150)

1. Study the Effect Surface area on rate of evaporation
2. Study the Effect of viscosity on rate of evaporation
3. Study the Effect of conc. on rate of evaporation
4. Separate turpentine oil from water turpentine oil mixture by steam distillation process
5. Study the crystallization behavior of potassium nitrate
6. Study the crystallization behavior of copper sulphate
7. Study principle of centrifugation for Solid – liquid separation and stability of suspension.
8. Determine the humidity and relative humidity of the ambient environment using pcychrometer
9. Determine the humidity of the air by dew point method
10. Determine water vapour permeability
11. Determine equilibrium moisture content of starch and bentonite at different humidities and at room temperature
12. Study of validation protocol for HVAC

Recommended Books:

1. Badger W.L. and Banchero J.T. Introduction to Chemical Engineering McGraw Hill International Book Co., London.
2. Perry R.H. & Chilton C.H. Chemical Engineers Handbook, McGraw Kogakusha Ltd.
3. McCabe W.L. and Smith J.C. Unit Operation of Chemical Engineering McGraw Hill International Book Co., London.
4. Sambhamurthy, Pharmaceutical Engineering, New Age Publishers.
5. Validation in pharma industry by PP Sharma current edition
6. Cooper and Gunn's Tutorial Pharmacy, CBS Publishers, New Delhi

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Environmental Studies**	Course Code: **NB4060**
Credit: 3	L: **3** T: **0** P: **0**
Year: **2nd**	Semester: **IV**

UNIT-I

Introduction of environmental science, Environmental education and Awareness, Global Environmental problems, (Global warming, ozone depletion and acid rain) Environmental priorities in India, General idea about Environmental laws, Environmental ethics, Environmental ethics Global imperatives.

UNIT-II

Sources, types, effects and control of: Water pollution, Air Pollution, Noise Pollution, Land pollution, Marine pollution, Thermal Pollution and Radioactive pollution.

UNIT-III

Natural Resources: concept of resources, types of resources, water resources, land resources, biological resources, Energy resources, mineral resources, human resources, conservation of natural resources, environmental impact of degradation of resources.

UNIT-IV

Sources and generation of solid waste, their characteristics, chemical composition and classification, Different method of disposal and management of solid waste (Hospital Waste and Hazardous waste) recycling of waste material, Waste minimization technologies, Hazardous Waste Management and Handling Rule, 1989, resource Management, Disasters Management and Risk analysis.

UNIT-V

Definition , Principles and scope of ecology, Human ecology and Human settlement, evolution, origin of life and speciation, ecosystem: Structure and functions, Abiotic and biotic components, energy flows, food chains, Food, web, Ecological pyramids, types and diversity, Ecological succession, population, community ecology ad Parasitism, Preypredator relationships

Recommended Books:

1. Manoharachary C., Jyaranama Reddy P. Principles of Environmental Studies, Pharma Book Syndicate, Hyderabad.
2. Trivedy R.K., Handbook of Environmental Laws, Acts, Guidelines, Compliances Standards Vol. I &II. Pharma Book Syndiacte, Hyderabad
3. Relevant Acts & Rules published by Govt. of India with latest amendments.
4. Reddy, M.Anji , ‘ Text Book of Environmental Sciences & Technology”.
5. National Formulary of India, Latest edition

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Pharmaceutical Technology – I (Pharmaceutics-VI)**	Course Code: **NA5010**
Credit: 3	L **3** T **0** P **0**
Year: **3rd**	Semester: **V**

UNIT-I

A: Product development stages.

B: Preformulation studies: Goal of preformulation studies and implementation of preformulation study objectives to develop a suitable dosage forms. Complexation and its Role in solubility enhancement.

UNIT-II

Tablets:

(A) Tablet: definition, types and advantages and disadvantages

(B) Granulation technology on large- scale by various techniques, physics of tablets making, machinery and tooling , various methods of manufacturing of tablets and their advantages over each other , evaluation of tablets (including tablet defects their causes and remedies) as per IP specifications**.**

(C) Coating of Tablets: Sugar and film coating, film forming materials, formulation of coating solution, principle of coating process and equipments for coating process, variables for coating evaluation of coated tablet. (Including film defects their causes and remedies) Selection Criteria for Punches, Validation of Punches. Problems in Tablets formulations due to Punches

UNIT-III

Capsules: Introduction to capsules as a dosage form, hard and soft gelatin capsules, formulation and evaluation, machinery, packaging, storage and stability testing

UNIT-IV

Liquid Dosage Forms: Introduction, formulation, manufacturing, evaluation and packaging of clear liquids, suspensions, and emulsions

UNIT-V

Semisolid Dosage Forms and suppositories

A: Types, mechanisms of drug penetration, factors influencing penetration, formulation, manufacturing , evaluation and packaging of semisolids.

B: Suppositories: Ideal requirements for bases, manufacturing procedure, evaluation and packaging

List of Experiments

1. Preformulation studies of API. (As per pharmacopoeial requirements)
2. Preparation, evaluation and packing of liquid orals like clear solutions
3. Formulation and evaluation of tablets using various binding agents
4. Formulation and evaluation of tablets using various disintegrating agents
5. Formulation and evaluation of tablets using various binding agents
6. Formulation and evaluation of tablets dispersible tablets
7. Formulation and evaluation of tablets by wet granulation method
8. Formulation and evaluation of tablets by direct compression
9. Formulation and evaluation of tablets by slugging method
10. Formulation and evaluation of capsule dosage form by hand filling method
11. Formulation and evaluation of capsule dosage form by machine fill method
12. Preparation, evaluation and packing of suspensions .
13. Preparation, evaluation and packing of emulsions.
14. Preparation, evaluation and packing of suppositories
15. Preparation, evaluation and packing semisolids like ointments gels etc

Recommended Books:

1. Remington: The Science and Practice of Pharmacy Pharmaceutical Sciences Vol. I & II Lippincott William Wilkins
2. R.E. Avis, Pharmaceutical Dosage Forms: Parenteral Medication, Vol-I, Marcel Dekker-Inc, New York & Basel.
3. H.C. Ansel, Introduction to Pharmaceutical Dosage Forms, Lippincott William Wilkins
4. Herbert A. Liebermann & Leon Lachman, Theory & Practice of Industrial Pharmacy,
5. Augsburger Larry L."Pharmaceutical Doasage Forms: tablets " 3rd edition Informa healthcare
6. IP (Latest edition)
7. BP (Latest edition)

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Medicinal Chemistry – I (Pharmaceutical Chemistry-V)**	Course Code: **NA5020**
Credit: 3	L **3** T **0** P **0**
Year: **3rd**	Semester: **V**

Mode of action, uses, SAR of the following classes of drugs included in latest edition of pharmacopoeia (synthetic procedures and assay of individually mentioned drugs only)

UNIT-I

Basic Principles of Medicinal Chemistry: . Drug-receptor interaction,,Concepts of prodrug.
Drugs acting on the Central Nervous System:
General Anaesthetics-Thiopental, Ketamine Local Anaesthetics- Lignocaine, Benzocaine. Sedatives and Hypnotics- Phenobarbitone

UNIT-II

Anticonvulsants-Phenytoin, Carbamazepine, Ethosuximide,Valproic Acid
Antiparkinsonism drugs- Levodopa.
CNS Stimulants-Caffeine, Amphetamine.

UNIT-III

Psychopharmcological Agents:
Antianxiety drugs- Diazepam, Alprazolam. Antidepressants – Imipramine, Amitriptyline Fluoxetine.
Antipsychotic- Chlorpromazine, Haloperidol.

UNIT-IV

Anti-cancer drugs
Alkylating Agents- Thiotepa,Chlorambucil , Antimetabolites- Methotrexate, 5-FU

UNIT-V

Introduction, Classification, Mode of action, uses, structure-activity relationship of the following classes of drug (Synthetic procedures of individually mentioned drugs only).
Thyroid and Antithyroids – Levothyroxine, Propylthiouracil
Hypoglycaemics - Chlorpropamide, Metformin, Tolbutamide , Glibenclamide

List of Experiments (NA5120)

1. Synthesis of atleast five drugs from the course content involving two or more steps. Ex :- Benzocaine, Phenytoin, Barbituric acid, Nikethamide, Benzocaine etc
2. Monographic analysis of the drugs and marketed formulation as per IP.
3. Microwave assisted synthesis of API (Any 2)
4. Synthesis of drugs for specific site targeting.

Recommended Books:

1. Delagado J N and Remers W A R, Eds., Wilson And Giswold's Text book of OrganicMedicinal and Pharmaceutical Chemistry, J. Lippincott Co., Philadelphia.
2. Foye W C, Principles of Medicinal Chemistry, Lea & Febiger, Philadelphia.
3.Wolff ME, Ed. Burger's Medicinal Chemistry, John Wiley & Sons, New York.
4. Singh Harkrishan and Kapoor, V.K., Organic Pharmaceutical Chemistry, Vallabh Prakashan, Delhi.
5. Patrick G L. Medicinal Chemistry, Oxford University Press NY
6. Vardanayan R. Synthesis of Essential Drugs, Acacdemic press an imprint of Elsevier
7. Pharmacopoeia of India, Ministry of Health, Govt. of India.

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Pharmacognosy – III**	Course Code: **NA5030**
Credit: 3	L **3** T **0** P **0**
Year: **3rd**	Semester: **VI**

UNIT – 1

Extraction, isolation and separation techniques of active principles: From crudes herbal drugs.

UNIT – 2

Introduction, classification, different chromatography methods and their applications in evaluation of herbal drugs.

UNIT – 3

Systematic Pharmacognostic Study of the following drugs containing volatile oils:

ral methods of isolation and characterization of Mentha, Coriander, Cinnamon, Cassia, Lemon peel, Orange peel, Lemon grass, Citronella, Caraway, Dill, Spearmint, Clove, Fennel, Nutmeg, Eucalyptus, Chenopodium, Cardamom, Valerian, Musk, Palamarosa, Gaultheria, Sandalwood

UNIT – 4

Systematic Pharmacognostic Study of the following:

Fixed oil, Fats and Waxes - Bees wax, castor oil, Cocoa butter, Cod liver oil, Hydnocarpus Oil, Kokum butter, Lard, Linseed oil, Shark liver oil and wool fat.

Pharmaceutical aid from natural sources: Talc, Asbestos, Bentonite, Kaolin and Prepared Chalk.

UNIT – 5

Pharmacopoeial studies: Herbal Pharmacopoeia and Compendia; Indian Pharmacopoeia, Ayurvedic Pharmacopoeia of India, Chinese herbal Pharmacopoeia &United States Pharmacopoeia for Herbal monographs.

List of Experiments (NA5130)

1. Extraction, isolation and separation techniques for active constituents.
2. Macroscopic and Microscopic study of some drugs in theory.
3. Evaluation parameters for fats, lipids and oils.
4. Study of pharmaceutical aids.
5. Monograph study for some selected drugs mentioned in the theory.

Recommended Books:

1. N.Kalia: “A text Book of Industrial Pharmacognosy”, 1st edition, CBS Publishers.
2. W.C.Evans: “Trease and Evans Pharmacognosy”, 15th edition, Saunders, Elsevier, 2007.
3. Phillipa.Grubb: “Plants for Chemicals, Pharmaceuticals and Biotechnology”,
4. C.K.kokate: “A Text Book of Industrial Pharmacognosy”,
5. Wallis: “A Text Book of Industrial Pharmacognosy”,
6. Quadry and Shah: “A Text Book of Industrial Pharmacognosy”,

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Pharmacology – V**	Course Code: **NA5040**
Credit: 3	L **3** T **0** P **0**
Year: **3rd**	Semester: **V**

UNIT – 1

Dose response curve, potency and efficacy, Therapeutic Index: LD50, ED50, Bioassy: principles, types and methods

UNIT – 2

Pharmacology of ANS: Parasympathomimetic (Cholinergic) drugs, Parasympatholytic (anti Cholinergic) drugs, Drug acting on autonomic ganglia (Stimulants and blocking agents), Sympathomimetic (Adrenergic) drugs Sympatholytic (Anti-adrenergic) drugs

UNIT – 3

CNS: Alcohols & disulfiram, Sedative hypnotics, Anti anxiety agents, antipsychotics, antidepressants. Antiepileptic drugs, Antiparkinsonism drugs

UNIT – 4

General anesthetics and Local anesthetics
Skeletal muscle Relaxants Peripherally and centrally acting muscle Relaxants

UNIT – 5

Heavy metals and heavy metal antagonists. General principles of treatment of poisoning with particular reference to barbiturates, opioids, organophosphorous and atropine poisoning.

List of Experiments (NA5140)

Use of computer simulated CDs or Video cassetes for pharmacology practical where possible.
1. Preparation of different solutions for experiments.
2. Drug dilutions, use of molar and w/v solutions in experimental pharmacology.
3. Common laboratory animals and anesthetics used in screening of pharmacological action.
4. Instruments used in experimental pharmacology.
5. Standard techniques in pharmacology experiments.
6. Study of different routes of administration of drugs.
7. Practical related to DRC using software
8. Bioaasy using software (Graphical method)

Recommended Books:

1. Goodman & Gilman, The Pharmacological basis of Therapeutics, McGraw Hill Pub Co., Current Edition
2. Turley, Understandig pharmacology, 3ed, ed, Pearson educations, Current Edition
3. Tripathi, K.D. Essentials of Medical Pharmacology, Jay Pee Publishers, New Delhi.Current Edition
4. Satoskar & Bhandarkar; Pharmacology & Pharmacotheropeutics., Popular Prakashan Pvt. Ltd. Bombay. Current Edition
5. Frieddman, Fundamentals of clinical trails, 3rd, ed,. Springer Intl, Current Edition
6. Bothara Sunil, Essentials of Experimental pharmacology, vol. 1. PharmaMed Press,Current Edition
7. Ghosh, MN; Fundamentals of Experimental Pharmacology, Scientific Book Agency, Calcutta. Current Edition
7. Grover J.K., Experiments in Pharmacy & Pharmacology, CBS Publishers, New Delhi., Current Edition
8. Kulkarni S.K., Hand Book of Experimental Pharmacology, Vallabh Prakashan, Delhi., Current Edition
9. Turner, Screening Methods in pharmacology,Elsvier, Current Edition

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Biochemistry (Pharmaceutical Chemistry – III)**	Course Code: **NA5050**
Credit: 3	L **3** T **0** P **0**
Year: **3rd**	Semester: **V**

UNIT – 1

Enzymes - Enzyme Kinetics, Enzyme Inhibition, Clinically diagnostic applications of Isoenzymes, Role of Coenzymes in Different Biological Reactions, Enzyme Immobilisation and applications of enzyme engineering. Study on Pathological Interpretation of Enzymes in Disease Processes

UNIT – 2

Glycolysis, Gluconeogenesis, Glycogenolysis, Pentose Phosphate Pathway, Citric Acid Cycle and their regulation, Significance of Citric Acid Cycle, Effect of disease process on carbohydrate metabolism

UNIT – 3

Respiratory Chain, Oxidative Phosphorylation

Molecular Action of Hormones (Expecially Epinephrine, Insulin, Glucagon), Biological Hormones of Medicinal Importance, Role of Secondary Messengers in cell,

Introduction to Signal Transduction, Receptor Down-Regulation and Up-Regulation.

UNIT – 4

Metabolism of Fatty acids and their Regulation,

Metabolic Study of Following :- Nucleotides , Amino Acids

A Brief Study of Essential Fatty acids, Ketone Bodies and Problems associated with it.

UNIT – 5

Dna Replication, Transcription and Translation in Eukaryotes and Prokaryotes, Genetic Code

List of Experiments (NA5150)

1. Preparation of standard buffers (citrate, phosphate and carbonate) and measurement ofpH.
2. Titration curve for amino acids
3. Separation of amino acids by chromatography
4. Separation of lipids by TLC.
5. Quantitative estimation of amino acids
6. Determination of glucose by means of the enzyme glucose oxidase.
7. Enzymatic hydrolysis of glycogen by α & β amylase
8. Effects of temperature on the activity of alpha amylase
9. Estimation of cholesterol in Blood.
10. Estimation of Glucose in blood & urine
11. Estimation of Urea in blood
12. Estimation of ketone bodies in blood
13. Qualitative analysis of inorganic as well as organic constituents of Urine
14. Interpretation and comparision of biochemical data /pathological report(any 5)

Recommended Books:

1. Lehninger Principles of Biochemistry, Macmillan Higher Education, 2008
2. Harper's Illustrated Biochemistry, McGraw Hill Professional, 2009
3. Lubert Stryer, Jeremy M. Berg, John L. Tymoczko, Biochemistry W.H.Freeman & Co Ltd
4. Benjamin Lewin Genes Jones & Bartlett Learning
5. Boyer, modern experimental biochemistry, Pearson education
6. Plummer, David J., An Introduction to Practical Biochemistry, Mc Graw Hill, New Delhi.

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Pharmaceutical Technology – II (Pharmaceutics-VII)**	Course Code: **NA6010**
Credit: 3	L **3** T **0** P **0**
Year: **3rd**	Semester: **VI**

UNIT – 1

A. Introduction to parenteral dosage form, Aqueous & non aqueous vehicles and their selection.

B. Requirements for manufacturing: source of contamination, premise, aseptic handling, flow of material between aseptic and non aseptic area, concept of clean room, class100 and 1000 rooms, aseptic handling and requirements

UNIT – 2

General method of preparations of LVPs, SVPs and Ophthalmic Formulations. Formulation of sterile powders for injection, sterile emulsion, sterile suspensions, and lyophilized powders for injection.

Quality control of parenteral product: Pyrogen testing (BET and LAL), leak test, particulate test with specification, sterility test IP

UNIT – 3

Sustained and controlled release

A: Approaches to Sustained and controlled release dosage forms. In-vitro methods of evaluation.

B: Micro-encapsulation: Types of microcapsule, importance of micro-encapsulation in pharmacy, micro-encapsulation techniques, evaluation of micro capsules.

UNIT – 4

Cosmetics Cosmetology and cosmetic Preparations: Formulation of cold cream, vanishing cream, cleansing cream, all purpose cream, sunscreen lotion, antiperspirants, deodorant. Shampoos, Conditioner, Shaving and after shaving products, Dentifrice Lipstick, Nail lacquer.

UNIT – 5

Aerosols: Pharmaceutical Aerosols: Definition, Propellants and their selection, general formulation and evaluation, manufacturing (lab and large scale) and packaging methods, pharmaceutical applications.

List of Experiments (NA6110)

1. Sterlity testing of the parenteral formulation and validation of sterilization methods
2. Formulation evaluation and packaging of parenteral formulation of water soluble and water insoluble APIs
3. Sealing of ampoules by pull seal method and evaluation of the sealing
4. Sealing of ampoules by tip seal method and evaluation of the sealing
5. Sterlization and washing of ampoules and vials
6. Sealing of vials and evaluation of sealing
7. Microencapsulation by different methods
8. Preparation and evaluation of cold cream, vanishing cream, cleansing lotion and creams. Moisturizing creams, Skin tonics, Hair creams, Hair Conditioners, Shampoos, Shaving creams and sticks. Tooth powder, Tooth pastes, After shave lotion, Lipstics.

Recommended Books:

1. Remington's Pharmaceutical Sciences, Vol. I & Vol. - II, Mack Publishing Co., U.S.A.
2. Dinda,SC, Advances in pharmaceutical Technology, PharmaMed Press, Hyderabad.
3. Lachman L., Lieberman H.A, Kanig J.L, Theory and Practice of Industrial Pharmacy, Lea & Febiger, Philadelphia, USA
4. H.C. Ansel, Introduction to Pharmaceutical Dosage Forms, Lea & Febiger, Philadelphia, U.S.A.
5. Harrys Cosmetology
6. Thomssen E.G. Modern Cosmetics, Universal Publishing Corporation.
7. Drugs and Cosmetics Act and Rules
8. Poucher "Cosmetics". Pharmamed press, Hyderabad

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Medicinal Chemistry–II (Pharmaceutical Chemistry-VII)**	Course Code: **NA6020**
Credit: 3	L **3** T **0** P **0**
Year: **3rd**	Semester: **VI**

Mode of action, uses, SAR of the following classes of drugs included in latest edition of pharmacopoeia (Synthetic procedures and assay of individually mentioned drugs only)

UNIT – 1

Basic concept of drug design, Introduction to Analogues based drug design, Structure based drug design, and Introduction to QSAR & Computer aided drug design.

UNIT – 2

Cardiovascular Drugs –
Antiarrhythmic drugs- Propranolol, Procainamide
Antianginal drugs- Isosorbide mononitrate
Antihypertensive drugs-Enalapril, Methyldopa, Nifedipine. **Antihyperlipedmics**- Clofibrate

UNIT – 3

Drugs acting at Synaptic and neuro-effector junction sites:
Cholinergic, Anticholinergic & Anticholinesterases- Neostigmine, Physostigmine, Pilocarpine, Atropine.
Adrenergic Drugs- Ephedrine, Salbutamol, Adrenaline

UNIT – 4

Analgesics and Antipyretics - Diclofenac, Aceclofenac Paracetamol, Celecoxib,
OPOIDS Analgesic-Pethidine,Methadone
Antispasmodic and Antiulcer drugs- Dicyclomine, Ranitidine

UNIT – 5

Diuretics – Acetazolamide, Chlorthiazide; Furosemide .
Anti-platelet drugs-Aapirin , Immuno suppressants - (Azathioprine).

List of Experiments (NA6120)

1. Synthesis of at least 5 selected drugs from the course content involving 2 or more steps.
2. Monographic analysis of the Medicinal compounds and marketed formulation as per IP.
3. Microwave assisted synthesis of Medicinal compounds (Any 2)

Recommended Books:

1. Delagado J N and Remers W A R, Eds., Wilson And Giswold's Text book of Organic Medicinal Pharmaceutical Chemistry, J. Lippincott Co., Philadelphia.
2. Foye W C, Principles of Medicinal Chemistry, Lea & Febiger, Philadelphia.
3. Wolff ME, Ed. Burger's Medicinal Chemistry, John Wiley & Sons, New York.
4. Harkrishan and Kapoor, V.K., Organic Pharmaceutical Chemistry, Vallabh Prakashan, Delhi.
5. Patrick G L. Medicinal Chemistry, Oxford University Press NY
6. Vardanayan R. Synthesis of Essential Drugs, Acacdemic press an imprint of Elsevier
7. IP

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Plant Biotechnology (Pharmacognosy-IV)**	Course Code: **NA6030**
Credit: 3	L **3** T **0** P **0**
Year: **3rd**	Semester: **VI**

UNIT -I

Plant tissue culture: Introduction, Types, different methods and techniques in PTC and culture media. Industrial Applications of plant tissue culture in production of pharmaceutically important secondary metabolites.

UNIT –II

Biogenetic pathways for primary and secondary plant metabolites of Pharmaceutical importance: Carbohydrates, lipids, alkaloids, glycosides, steroids, terpenes and terpenoids.

Bioreactors: Importance, its design, control of different parameters, Types and their Importance in production of secondary plants metabolites.

UNIT-III

Immobilization of enzymes: Methods, advantages and disadvantages. Multistep immobilized enzyme system. Application and future of enzyme engineering

UNIT-IV

Gene cloning: Recombination DNA techniques, Gene Cloning and their applications. Transformation, conjugation, transduction, protoplast fusion

UNIT –V

Fundamentals of genetic engineering: basic techniques like agarose-gel electrophoresis, Southern blotting and Northern blotting. Pharmaceutical drugs from r-DNA Technology like Insulin, urokinase, Alteplase, Humatrope.

Recommended Books:

1. W.C.Evans: “Trease and Evans Pharmacognosy”, 15th edition, Saunders, Elsevier, 2007.
2. T A Brown”,Gene Cloning and DNA Anlaysis” 6th Edition, Blackwell Publishers
3. Phillipa.Grubb: “Plants for Chemicals, Pharmaceuticals and Biotechnology”,
4. C.K.kokate: “A Text Book of Industrial Pharmacognosy”,
5. Wallis: “A Text Book of Industrial Pharmacognosy”,
6. Quadry and Shah: “A Text Book of Industrial Pharmacognosy”,
7. Roberta Smith “Plant Tissue Culture-Techniques and Experiments” Academic Publishers

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Pharmacology – VI**	Course Code: **NA6040**
Credit: 3	L **3** T **0** P **0**
Year: **3rd**	Semester: **VI**

UNIT –I

Pharmacology of CVS: Cardiac glycosides, Antihypertensive drugs, Antianginal drugs, Antiarrhythmics, Antihyperlipidemics

Unit –II

Drug acting on urinary system: Diuretics and antidiuretic hormones

Drugs Acting on Respiratory System: Anti-asthmatic drugs, Anti-tussives & Expectorants, Respiratory Stimulants

UNIT-III

Opioid analgesic and antagonist, endogenous opioids, Non steroidal anti-inflammatory drugs & Anti-gout Drugs

UNIT-IV

Autocoids: Prostaglandins, Thromboxane, Leukotrienes, Angiotensin and Bradykinin

Immunomodulatory drugs: Immunosuppressant and immunostimulant drugs,

UNIT-V

Drugs acting on GIT: Antacids and Antiulcer drugs, Laxatives and antidiarrhoeal Agents, Emetics and antiemetics

List of Experiments (NA6130)

1. Relevant simulated experiments based on theory syllabus using software.
2. Screening models for evaluation of analgesic, anti-inflammatory, antiulcer, and CNS disorders using software. (Any three for each category)
3. Practical project on drug information profile of new drugs on theory syllabus

Recommended Books (Current Edition):

1. Goodman & Gilman, The Pharmacological basis of Therapeutics, McGraw Hill Pub Co.,
2. Turley, Understandig pharmacology, 3rd ed, Pearson educations,
3. Tripathi, K.D. Essentials of Medical Pharmacology, Jay Pee Publishers, New Delhi.
4. Satoskar & Bhandarkar; Pharmacology & Pharmacotheropeutics., Popular Prakashan Pvt. Ltd. Bombay.
5. Frieddman, Fundamentals of clinical trails, 3rd ed,. Springer Intl,
6. Bothara Sunil, Essentials of Experimental pharmacology, vol. 1. PharmaMed Press,
7. Ghosh, MN; Fundamentals of Experimental Pharmacology, Scientific Book Agency, Calcutta.
7. Grover J.K., Experiments in Pharmacy & Pharmacology, CBS Publishers, New Delhi.,
8. Kulkarni S.K., Hand Book of Experimental Pharmacology, Vallabh Prakashan, Delhi.,
9. Turner, Screening Methods in pharmacology,Elsvier,

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Biostatistics**	Course Code: **JA6050**
Credit: 3	L **3** T **0** P **0**
Year: **3rd**	Semester: **VI**

UNIT -I

Linear Regression and Correlation: Introduction of linear and non linear regression ,Analysis of Standard Curves in

Drug Analysis: Application of Linear Regression and Drug stability studies

UNIT –II

Analysis of Variance: One- Way Analysis of Variance Planned Versus a Posteriori (Unplanned) Comparisons in

ANOVA, Another Example of One-way Analysis of Variance: Unequal Sample Sixes and the Fixed and Random Models, Two-Way Analysis of Variance (Randomized Blocks), Statistical Models, Analysis of Covariance, ANOVA for pooling regression lines as related to stability data.

UNIT-III

Nonparametric Methods: Data Characteristics and an Introduction to Nonparametric Procedures, Sign Test, Wilcoson Signed Rank Test, Wilcoxon Rank Sum Test (Test for Differences Between Two Independent Groups), Kruskal Wallis Test (One- Way ANOVA),

UNIT-IV

Factorial Designs : Definitions Two Simple Hypothetical Experiments to Illustrate the Advantages of Factorial Designs, Performing Factorial Experiments: Recommendations and Notation, A Worked Example of a Factorial Experiment, Fractional Factorial Designs

UNIT –V

Experimental Design in Clinical Trials: Introduction, Some Principles of Experimental Design and Analysis, Parallel Deign, Crossover Designs and Bioavailability / Bioequivalence Studies, Repeated Measures (Split- Plot) Designs, Multicentric Studies and Interim Analyses

Recommended Books:

1. Bolton, S and Bon, C, Pharmaceuticals Statistics- Practical & Clinical Applications, Marcel & Dekker, New York.
2. Fisher, R.A., Statistical Methods for Research Works, Oliver & Boyd, Edinburgh.
3. Chow, Statistical Design and Analysis of Stability Studies, Marcel Dekker, New York.

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Biopharmaceutics & Pharmacokinetics (Pharmaceutics- VIII)**	Course Code: **NA7010**
Credit: 3.5	L: **3** T: **0** P: **0**
Year: **4th**	Semester: **VII**

UNIT-I

Applied integration and differentiation in Biopharmaceutics

UNIT-II

Introduction To Biopharmaceutics And Pharmacokinetics, Biopharmaceuitcal Classification System

A:Absorption: Various Mechanisms and Factors Influencing Absorption of Drug.

B:Distribution: Mechanism, Barriers To Drug Distribution, Factors Influencing Distribution Of Drug Through Body. Concept Of Volume Of Distribution

C:Protein Binding: Types Of Protein Binding, Tissue Binding Of Drug, Factors Influencing Protein Binding, Significance Of Protein Binding, Kinetics Of Protein Binding.

Pharmacokinetics:

A: Significance Of Plasma Drug Concentration Measurement.

B:Concept Of Compartment Models And Non-Compartment Model And Applications

UNIT-III

Compartment modeling: Basic concept of developing a model,

A:One compartment open model: IV bolus, IV infusion, extra vascular administration, urinary excretion model and calculation of various pharmacokinetic parameters

B.Multicompartment models: preliminary information of two compartment models,

UNIT-IV

Bioavailability and Bioequivalence: Definition, types, factor affecting bioavailability, methods of improving bioavailability, measurement of bioavailability, bioavailability and bioequivalence studies

UNIT-V

(A) Dosage regimens

(B) Dosage adjustment in patients with and without renal and hepatic failure.

List of Experiments (NA7110)

1. Experiments designed for the estimation of various pharmacokinetic parameters with given data.
2. In vitro evaluation of different dosage forms for drug release.
3. Absorption studies - in vitro.
4. Bioavailability and Bioequivalence studies
5. Permeability studies
6. Protein binding
7. Statistical treatment of pharmaceutical data.

Recommended Books:

1. Notari, R.E, Biopharmaceutics and Pharmacokinetics - An introduction Marcel Dekker Inc. N.Y.
2. Rowland M, and Tozer T.N. Clinical Pharmacokinetics, Lea and Febriger, N.Y.
3. Wagner J.G. Fundamentals of Clinical Pharmacokinetics, Drugs Intelligence Publishers, Hamilton.
4. Gibaldi, Milo' Biopharmaceutics & Clinical pharcokinatics.
5. John. G.Wagner," Pharmacokinetics for the Pharmaceutical Scientist'.

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Pharmacopoeial Standards**	Course Code: **NA7020**
Credit: 3	L **3** T **0** P **0**
Year: **4th**	Semester: **VII**

UNIT-I

Test Methods - Biological Methods (Abnormal Toxicities, Effectiveness Of Antimicrobial Preservatives, Bacterial Endotoxins, Peptide Mapping)

UNIT-II

Test Methods - Physical & Physiochemical Methods (Diffrential Scanning Calorimetry, Isoelectric Focussing)

UNIT-III

Containers Types , General Require Ments, Tests On Containers, General Monographs On Dosage Forms

UNIT-IV

General Monographs of Parenterals, (General Requirement, Dip Concentrates, Intramammary Infusionveterinary Aerosols)

UNIT-V

Illustrative Studies of 2 Monographs Each For API (Paracetamol, Dexamethasone), Excipients (Lactose, Starch) And Dosage Forms (Amoxicillin Dry Syrup)

Text Books:

1. Indian Pharmacopoeia (all editions).

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Pharmacognosy – V (Industrial Pharmacognosy)**	Course Code: **NA7030**
Credit: 3	L **3** T **0** P **0**
Year: **4th**	Semester: **VII**

UNIT-I

Industrial production of Phyto-pharmaceuticals : (Isolation and estimation of phyto-pharmaceuticals)

Acorus calamus: Asarone
Aloe barbadensis : Aloin & Aloesin
Adhatoda vasica: Vasicine
Andrographis paniculata: Andrographolides
Berberis aristata : Berberine
Curcuma longa: Curcumin
Garcinia cambogia: L- Hydroxy citric acid
Glycyrrhiza glabra: Glycyrrhizinic acid & its other derivatives
Gymnema sylvestre: Gymnemic acid
Phyllanthus amarus: Phyllanthin
Picrorhiza kurroa : Kutkin
Tribulus terestris: Total saponins
Withania somnifera: Withanolides
Zingiber officinale: Gingerol
Commiphora mukul: Guggulsterone
Trigonella foenum: Saponins.

UNIT-II

Nutraceuticals and antioxidants: Plants against free radicals and as antioxidants. Herbs as Health foods and concept of nutraceuticals.

UNIT-III

Marine Pharmacognosy:

a)Definition, present status, classification of important bioactive agents.
b) General methods of isolation and purification.
c) Study of important bioactive agents including chemistry & uses

UNIT-IV

High throughput Screening and importance of heavy metals and Lead molecules.
Role of Biological and HPTLC Markers in Plant drug analysis.
Stability and Toxicity Studies of Phyto-medicines.

UNIT-V

Herbal regulatory parameters for industrial production:

Ayurvedic formulary of India, Ayurvedic pharmacopoeia of India, GMP, ICH guidelines.

List of Experiments (NA7130)

1. Extraction, isolation and identification techniques for phyto-constituents.
2. Chromatographic studies for single phyto-constituents.

Recommended Books:

1. Quality Control of Herbal Drugs by Pullok K. Mukherjee, 1st edition, Business
2. Horizons Pharmaceutical Publisher, New Delhi, 2002
3. Indian Herbal Pharmacopoeia, vol. 1 & 2, RRL, IDMA, 1998, 2000 (Current Edition)
4. PDR for Herbal Medicines, 2nd edition, medicinal economic company, New Jersey,
5. Wallis: "A Text Book of Industrial Pharmacognosy",
6. Quadry and Shah: "A Text Book of Industrial Pharmacognosy"
7 IP

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Pharmacology – VII0020**	Course Code: **NA7040**
Credit: 3	L: **3** T: **0** P: **0**
Year: **4th**	Semester: **VII**

UNIT-I

Pharmacology of endocrine system (Thyroid & antithyroid drug,s, Insulin & antidiabetics, Corticosteroids, Sex hormones, oxytocin and tocolytics

UNIT-II

Chemotherapy-principles, Sulfonamide, cotrimoxazole Pencillins, cephalosporins, chloramphenicol, erythromycin, fluoroquinolones and miscellaneous antibiotics.

UNIT-III

a) Chemotherapy of malaria, tuberculosis, leprosy, viral diseases and drug therapy of HIV /AIDS.
(b) Chemotherapy of malignancy
(c) Anthelmintics and Anti-amoebics

UNIT-IV

Pediatrics & Geriatrics and Pregnancy (Physiological changes, mechanism, Drugs usage and conta-indication in these conditions)

UNIT – V

Drugs Acting on Haemopoeitic System: Vit. K & anticoagulants, Fibrinolytics & antiplatelet drugs
Therapeutic drug monitoring, drug utilization evaluation(DUE) and review (DRU)

List of Experiments (NA7140)

1. Bioassay of agonist and antagonist by various methods using software
2. Determination of PA2 value using software.
3. Screening models for evaluation of anticancer, diuretic & antidiabetic activity using software. (Any three for each category)
4. Practical project on drug information profile of new drugs (one for each category) on theory syllabus
5. Therapeutic drug monitoring of digoxin, gentamycin etc.
6. Community service for creating awareness about preventive measures to be taken on the disease like AIDs, Cancer and Diabetes (Minimum 6 weaks) and reporting

Recommended Books:

1. Goodman & Gilman, The Pharmacological basis of Therapeutics, Pergamon Press. Editors:- J.G. Hardman, Le Limbird, PB Molinoss, RW Ruddon & AG Gil, Pergamon Press.
2. Katzung, B.G. Basic & Clinical Pharmacology, Prentice Hall, International.
3. Laurene, DR & Bennet PN; Clinical Pharmacology, Churchill Livingstone.
4. Rang MP, Dale MM, Riter JM, Pharmacology Churchill Livingstone.
5. Tripathi, K.D. Essentials of Medical Pharmacology, Jay Pee Publishers, New Delhi.
6. Satoskar & Bhandarkar: Pharmacology & Pharmacotheropeutics, Popular Prakashan Pvt. Ltd., Bombay.
7. Oxford Handbook of *Clinical Pharmacy* Philip Wiffen, Marc Mitchell, Melanie Snelling - 2012 - Preview - More editions
8. Churchill's Pocketbook of Clinical Pharmacy- edited by Nick D Barber, Alan Willson
9. Handbook of Institutional Pharmacy Practice edited by Thomas R. Brown-4th edition,
10. Naplex Secrets Study Guide: Naplex Test Review for the North American Pharmacist Licensure Examination, Naplex Exam Secrets, Mometrix Media Llc, 01-Aug-2010.
11. The Johns Hopkins consumer guide to drugs Simeon Margolis Medletter Associates.

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Pharmaceutical Management**	Course Code: **NA7050**
Credit: 3	L **3** T **0** P **0**
Year: **4th**	Semester: **VII**

UNIT – 1

Concept of Management : Administrative Management (Planning, Organizing Staffing Directing, and Controlling, Operative Management (Personnel, Materials, Production, Financial, Marketing, Time / space, Margin / Morale) Principles of Management (Coordination, Communication, Motivation, Decision making, leadership, Innovation Creativity, Delegation of Authority / Responsibility. Record Keeping).

UNIT – 2

Production Management : A brief exposure of the different aspects of Production Management– Visible and Invisible inputs, Methodology of Activities Performance Evaluation Technique Process, Maintenance Management.

UNIT – 3

Pharmaceutical Marketing: Functions, buying, selling, transportation, storage financed feedback information, channels of distribution, wholesale, retail, department store, multiple shop and mail order business.

UNIT – 4

Grievance Management: Grievance and Grievance Handling procedure, Causes of grievances, Need for grievance procedure, Grievance redressal machinery

UNIT – 5

Materials Management: A brief exposure of basic principles of management major areas, scope, purchase, stores, inventory control and evaluation of materials management.

Recommended Books:

1. Chary S.N, Production and Operative Management / Tata Mc Graw Hill.
2. Datta A.K., Material Management / PHI.
3. Chadwick Leslie, The essence of management accounting / PHI.
4. Koontz H, Weihrich H, Essentials of Management, Tata Mc Graw Hill.

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Cosmetology (*Elective-I*)**	Course Code: **NA7610**
Credit: 3	L **3** T **0** P **0**
Year: **4th**	Semester: **VII**

Structure and functions of skin and hair. Formulation considerations, preparation, packaging and evaluation of the following categories of cosmetics-

UNIT – 1

Fundamental of cosmetic science

Face Preparation: Face powder, Compact powder, Talcum powder, Face packs and Masks.

UNIT – 2

Skin Preparation: Skin creams, Anti-wrinkle preparations,, Protective creams and gels, Vanishing creams, Cold creams, Cleansing creams, all purpose creams,, Anti-perspirant,/ deodorant, Moisturising creams,, Sun-screen, Suntan, and anti-sun burn preparation**.**

UNIT – 3

Shaving Preparation: Lather shaving stick, Lather shaving creams, Shaving foams, Shaving gels, Pre-and After shave lotions**.**

Shampoo and Bath preparations: Clear liquid shampoos. Aerosol shampoos, dry shampoos, Acid-balanced shampoos, Egg shampoos, Anti-dandruff Shampoos, Bath oils, Foam baths.

UNIT – 4

Hair Preparations: Hair tonics, Hair conditioners, Hair lotions, Hair sprays, Hair dressings, Hair setting lotions and creams, Hair dyes, Bleaches, Hair waiving, Hair straightners and Hair strengthners**.**

Dentrifice: Tooth powders, Tooth pastes, Denture cleansers.

Foot Preparation: Foot powders, Foot sprays, Foot creams, Corn preparations and Athelete's foot preparation.

Manicure Preparation: Nail polish, Nail lacquers and Nail bleaches.

UNIT – 5

Herbal Cosmetics: Cosmetics containing Aloe, Babul, Brahmi, Chandan, Cucumber, Haldi, Jatamansi, Khus, Mehandi, Neem, Reetha, Shikakai, Tulsi, Arnica, Bhringraj and Volatile oils

Cosmetic for babies.

Colored make-up preparations: Lipsticks, Rouge, Mascara, Eye make-up, Eye-liner, Eyebrow pencils..

Recommended Books:

1. M. S. Balsam & Edward Sagarin (Eds.), Cosmetic Science and Technology, Vol. 1-3, Krieger Publishing Company. Florida.
2. Mac Chesney, J. C., Packaging of Cosmetic an Toiletries, Newness- Butterworth, London.
3. E.G., Thomssen, Modern Cosmetics, Universal Publishing Corporation, Bombay.
4. Jellinek, J.S. Formulation and Functions of Cosmetics, John Willey & Sons, New York.
5. R. K . Nema, K. S. Rathode, B.K. Dubey, Text Book of Cosmetics, CBS- Publishers & distributors, New Delhi.
6. Sunil Nanda, Arun Nanda & R.K. Khar, Cosmetic Technology, Birla publications Pvt. Ltd., Delhi.
7. B. M. Mithal and R.N. Saha, A handbook of cosmetics, Vallabh Prakashan, Delhi.
8. P.P. Sharma, Cosmetics- Formulation, Manufacturing & Quality control,Vandana Publications Pvt. Ltd, Delhi.
9. Hildo Butler (Ed.), Poucher's Perfumes, Cosmetics & Soaps, Kluwer Academic Publishers, The Netherland.
10.S.C. Bhata, Perfumes, soaps, Detergents and Cosmetics Vol. 1 & 2, CBS Publishers and Distributors, New Delhi.
11. Drug and Cosmetics Act & Rules.

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Pharmaceutical Enternprenuership (*Elective-I*)**	Course Code: **NA7620**
Credit: 3	L **3** T **0** P **0**
Year: **4th**	Semester: **VII**

UNIT – 1

Entrepreneurship- history & concept, importance
Entrepreneur- Leadership Attributes, Innovations, Influences, Personality Traits and Characteristics. Types of Entrepreneurs. Business etiquettes, Business language and Communication.

UNIT – 2

Entrepreneurship in the pharmaceutical industry- needs, problems and issues Importance of communication, decision making and problem solving skills. Business strategies, competition, marketing opportunities, supply chain management keeping in mind return on investments. Case studies -3 to 5

UNIT – 3

Identification of market for product and services, SWOT analysis Formulation of strategies, market leaders and success stories of their leading brands. Regulatory aspects- Drugs and Cosmetics Act and rules relevant to licensing requirements for retail, wholesale, (schedules H, G, L1, M, Miii, P, P1, U, V, X, Y); DPCO - price control and price fixation, Factory Act, Central and State Excise Act Including Vat, Environmental Protection Act covering air, water, solid waste disposal record keeping, income tax and sales tax, (include only relevant to working), quality system and its relevance.

UNIT – 4

Technology Transfer considerations Funding of projects- Financial, Bootstrapping, External Financing
Project Management, Financial Management – understanding of balance sheet and profit and loss accounts, imports and exports. (need based for understanding for practical application). Case studies – 3

UNIT – 5

Importance of HR recourses- team building and management Concept of social entrepreneurship & sustainable entrepreneurship (Growth oriented). Case studies-3

Recommended Books:

1. Welsh, J.A. & Jerry, F.W., 'Entrepreneur's Master Planning Guide, How to launch a successful business', Prentice Hall, Englewood cliff.
2. Srivastava U.K., 'Project Planning, Financing, Implementation and Evaluation, IIM, Ahmedabad.
3. Rao, T.V. & Pareek U, 'Developing Entrepreneurships: A Handbook'. Learning Systems, New Delhi.
4. Handbook of Entrepreneurship Research: An Interdisciplinary Survey and Introduction
5. Duening, Thomas N., Hisrich, Robert D., Lechter, Michael A., Technology Entrepreneurship, Academic Press, 2009.
6. Lundström, Anders und Stevenson, Lois (2005), Entrepreneurship Policy: Theory and Practice, Springer.
7. Deakins, D.; Freel, M. (2009). Entrepreneurship and Small Firms, 5th Edition. McGraw Hill.
8. Pharmaceutical Industry: Innovation & Developments (Business Issues, Competition and Entrepreneurship) by David A. Mancuso, Isobel M. Grenada Publisher: Nova Science Publishers Inc (3 Aug 2011)
9. The Business of Healthcare Innovation [Hardcover] Lawton Robert Burns, Cambridge University Press; 2nd edition
10. Bootstrapping Your Business: Start And Grow a Successful Company With Almost No Money by Greg Gianforte, Marcus Gibson, Publisher Adams Media 2005
11. Drugs and Cosmetics Act and Rules, and DPCO, Govt. of India.
12. Factory Act, Shop and Establishment Act.
13. Environmental Protection Act.

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **GMP, Quality Assurance & Validation (*Elective-I*)**	Course Code: **NA7630**
Credit: 3	L **3** T **0** P **0**
Year: **4th**	Semester: **VII**

UNIT – 1

No GMP- GMP- cGMP with reference to Indian scenario
Drugs & cosmetics rules with reference to G,H,M,P,P1, T,U,X
Requirements of GMP, CGMP, GLP, USFDA, WHO guidelines. & ICH Guidelines, ISO9000 and current updates.

UNIT – 2

Documentation- Protocols, Forms and maintenance of records in Pharmaceutical industry.
Preparation of documents for new drug approval and export registration (schedule L1 & Y)

UNIT – 3

Basic concept of quality assurance, Quality assurance systems. Self Inspectionss, investigations of market complaints, out of specifications (OoS), Out of Trends

UNIT – 4

Facility design- Concepts in validation, validation master plan, validation of product, process, equipment, machinery, systems. Cleaning, Building management systems

UNIT – 5

In process quality control tests, IPQA problems in pharmaceutical industries.
Sources and control of quality variation- raw materials, containers, closures, personnel, environment etc.
Pharmacopoeia standards for dosage form and acceptance criteria, Sampling plan,
Sampling and operating characteristics curves –IPC Controls from raw materials to finished products and packaging materials

Recommended Books:

1. Willing, Tuckerman and Hitchings, Good Manufacturing Practices for Pharmaceuticals.
2. OPPI, Quality Assurance.
3. Loftus and Nash, Pharmaceutical Process Validation.
4. Florey, Analytical Profile of Drugs (All volumes).
5. Indian Pharmacopoeia.
6. United States Pharmacopoeia.
7. British Pharmacopoeia.
8. Garfield, Quality Assurance Principles for Analytical Laboratories.
9. Manohar A. Potdar, C.GMP for Pharmaceuticals.
10. Sharma P.P. How to practice GMP's , Vandana Publication, New Delhi
11. Sharma P.P. Validation in pharmaceutical industry , Vandana Publication, New Delhi
12. TRS guidelines
13. ICH guidelines
14. Drugs and Cosmetic Act

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Drug Design (*Elective-I*)**	Course Code: **NA7640**
Credit: 3	L **3** T **0** P **0**
Year: **4th**	Semester: **VII**

UNIT – 1

Introduction to Drug Design, Lead Discovery, Interactions (Forces) involved in drug receptor complex, Physiochemical properties in relation to biological action, Sterochemical aspects in drug design, Bioisosterism

UNIT – 2

Drug metabolism-Phase I & Phase II Metabolic Reactions, Prodrugs & Soft drug concepts

UNIT – 3

a. Analogous based drug design concept with suitable examples
b. Structure Based drug design concept with examples

UNIT – 4

Combinatorial chemistry-Introduction, Parallel and Split & Mixed synthesis.

UNIT – 5

Introduction, parameters, Quantitative models- Hansch method & Software's in QSAR

Recommended Books:

1. E.J, Ariens: Drug Design, Academic Press, New York (1975).
2. S.H. Salkovisky, A.A. Sinkula and S.C. Valvani, Physical Chemical Properties of Drugs, Marcel Dekker Inc. New York.
3. M.E. Wolff, Burger's Medical Chemistry, John Willey and Sons, New York.
4. R.F, Doerge, Wilson and Gisvold's Text Book of Organic Medicinal and Pharmaceutical Chemistry, J. Lippincott Co, Philadelphia.
5. Olson, Edward C "Computer Assisted Drug Design (American Chemical Society).
6. Burger A "A guide to chemical basis of Drug Design "John Wiley & Sons".
7. Thomas J.Perun "Computer aided Drug Design methods Applications".

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Clinical Pharmacy (*Elective-I*)**	Course Code: **NA7650**
Credit: 3	L **3** T **0** P **0**
Year: **4th**	Semester: **VII**

UNIT – 1

Introduction To Clinical Pharmacy -Definition, development and scope

Patient Data Analysis -The patient's case history, its structure and use in evaluation of drug therapy, Communication skills including patient medication history interview, patient counseling.

UNIT – 2

Daily Activities Of Clinical Pharmacists -Drug therapy monitoring (Medication chart view, clinical review, TDM pharmacist interventions. Drug utilization evaluation (DUE) and review (DRU). Quality assurance of clinical Pharmacy services, Prescription auditing and medication errors and monitoring

UNIT – 3

Clinical Pharmacokinetics -Physiological determinants of drug clearance and volumes of distribution. Renal and non-renal clearance. Estimation and determinants of bioavailability. Calculation of loading and maintenance doses. Dose adjustment in renal failure, hepatic dysfunction, geriatric and paediatric patients.

UNIT – 4

Pharmacoepidemiology, Pharmacoeconomics & Pharmacovigilence.

Clinical trials: Introduction, types, Phases, essential features, experimental design, essential clinical trial documents, Informed consent document, audit of clinical trial, clinical trial team, patient recruitment, duties of Principle Investigator, Institutional ethical committee(IEC)

UNIT – 5

Research Design And Conduct Of Clinical Trials- Research support including planning and execution of clinical trials. Guidelines for good clinical research practice and declaration of Helsinki & Ethical requirements. Research design and study of any three drugs under Phase IV clinical trials.

Recommended Books :

1. Basic skills in interpreting laboratory data- Scott LT, American Society of Health System Pharmacists, Inc., USA.
2. Practice Standrds and Definitions- The Society of Hospital Pharmacists of Australia, 1997.
3. Clinical Pharmacokinetics-Rowland and Tozer, Williams and Wilkins Publication.
4. Biopharmaceutics and Applied Pharmacokinetics-Leon Shargel, Prentice Hall Publication.
5. Relevant review articles from recent medical and pharmaceutical literature.
6. Parthasarthi G, Nyfort-Hansen K, Nahata M.C., A Text book of Clinical Pharmacy Practice –Essential Concepts and Skills, Orient Longman.
7. Davisson's Pranciples and Practice of Medicine, ELBS/Churchill Livingstone.
8. Herfindal E.T. and Hirashman J.L., Clinical Pharmacy and Therapeutics Williams and Wilkins
9. John G.Wagner," Pharmacokinetics for the Pharmaceutical Scientist".

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Phytoformulation (*Elective-I*)**	Course Code: **NA7660**
Credit: 3	L **3** T **0** P **0**
Year: **4th**	Semester: **VII**

UNIT – 1

Study of traditional formulations as per Ayurvedic Formulary of India and few dosage forms (modern) in the market

UNIT – 2

Shelf life study, protocols to study stabilization of herbal based products.
Approaches for both physical. Physico-chemical and chemical parameters of assessment at different stages, interpretation of data and its limitations.

UNIT – 3

A) Herbal Cosmetics: Raw materials of herbal origin used in cosmetics: Oil, Waxes, Gums, Hydro-perfumes, protective agents, bleaching Agents, preservatives, Anti oxidation agents**.**
B) Formulation aspects incorporating herbal extracts in various preparations: Deodorants, Anti-perspirants, Hair care preparations, skin care preparations, dental care preparations.

UNIT – 4

Design of Ayurvedic dosage form and their evaluation: Solid, liquid and semi solid dosages forms. (Any four Ayurvedic formulation for each type).

UNIT – 5

Research: Needs, areas and current on going research. Application of pharmacy concepts, analytical methods and clinical evaluation techniques in herbals**.**

Recommended Books:

1. Quality Control of Herbal Drugs by Pullok K. Mukharjee, 1st Edition, Business Horizons Pharmaceutical Publisher, New Delhi, 2002.
2. Indian Hearbal Pharmacopoeia, vol. 1 & 2, RRL, IDMA, 1998, 2000 (Current Edition)
3. Standardization of Botanicals by V.Rajpal, Vol.1, Eastern Publisher, New Delhi
4. PDR for Herbal Medicines, 2nd edition, medicinal economic company, New Jersey, 2000.
5. Poucher: "A Text Book of Cosmetics",
6. Herbal Drug Industry by R.D. Choudhary, 1st edition, Eastern Publisher, New Delhi
7. Trease and Evans Pharmacognosy by W C Evans, 15th Edition W.B Saunders E

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Industrial Manufacturing Pharmacy (Pharmaceutics-IX)**				Course Code: **NA8010**
Credit: 3	L **3**	T **0**	P **0**	
Year: **4th**				Semester: **VIII**

UNIT-I

Pilot Plant, Scale up Techniques: Introduction**,** Objectives of the Pilot Plant**,** Importance of the Pilot Plant**,** Pilot plant design for tablets**,** Pilot plant scale-up techniques for capsules**,** Pilot plant scale-up techniques for Parenterals

UNIT-II

Technology Transfer involved in different dosage forms: importance of technology transfer, Technology Transfer Process, Reasons & factors influencing technology transfer, drivers and barriers, steps involved in technology transfer and to identify policy approaches for barriers.

UNIT-III

Elements Of Validation, Validation Master Plan, Reasons for validation, Pharmaceutical Process Validation, Equipment Validation and Product Validation, Regulatory Basis for Process Validation.

UNIT-IV

Requirements for the manufacturing of Solid, Liquid and Semisolid Dosage Form as per FDA & USFDA.

UNIT-V

Automation and control In pharmaceutical Industries: Advantages, General Automatic Control System, Automatic Controller, Computer Integrated Systems, Control Process Measurement, Automation in Solid & Liquid Dosage Manufacturing.

Reference Books:

1. Textbook of Industrial Pharmacy. Hiremath Shobha Rani - 2008 - 448 pages
2. Remington: The Science And Practice Of Pharmacy. David B. Troy, Joseph Price Remington, Paul Beringer - 2006 - 2393 pages
3. Challenges and trends in industrial pharmacy: 50 years of ... Tom Sam, Beta Communicaties (Den Haag), Industrial Pharmacy Section -2006 - 66 pages
4. The Theory and practice of industrial pharmacy. Leon Lachman, Herbert A.Lieberman, Joseph L. Kanig - 1986 - 902 pages
5. Automation of pharmaceutical operations: Supplement David J. Fraade- 1985 – Page - 103

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Pharmaceutical Jurisprudence (Pharmaceutics-X)**	Course Code: **NA8020**
Credit: 3	L: **3** T: **0** P: **0**
Year: **4th**	Semester: **VIII**

Current Acts & Rules with Amendments relevant to Drugs and Pharmaceuticals are required for following :

UNIT-I

a) Pharmaceutical Legislations – A brief review
b) Drugs and Pharmaceutical Industry – A brief review.
c) Pharmaceutical Education – A brief review
d) Pharmaceutical Ethics – A brief review
e) Pharmacy Act

UNIT-II

An Elaborative Study of current Rules and Amendments for Following :-

a) Drugs and Cosmetics Act and rules - Manufacturing , distribution and marketing , approval of manufacturing and quality control chemist, Schedules (M, Y, L1, P)
b) Drugs Price Control Order

UNIT-III

A Study of following Acts with Special Reference to current Provisions for following.

a) Medicinal & Toilet preparations (Excise duties Act)- relevant to drug and pharmaceuticals
b) Poisons Act
c) Medical termination of Pregnancy Act & Rules

UNIT-IV

A Study of following Acts with Special Reference to current Provisions for following.

a) Narcotic Drugs & Psychotropic Substances Act & Rules.
b) Drugs and Magic remedies (Objectionable Advertisements) Act
c) Patents Act, Trade mark and copyrights acts.- main provisions

UNIT-V

a) U.S Food and Federal D&C Act – CFR -21, CGMP; EuGMP ,WHO, Orange book
b) Introduction to ICH Guidelines, Legal requirement as per D &C rules and rules of importing countries for parentrals
c) Good HouseKeeping Practices and GLP

Recommended Books:

1. Mittal B.M, Textbook of Forensic Pharmacy, National Book Centre, Dr. Sundari Mohan Avenue, Calcutta.
2. Relevant Acts & Rules Published by the Govt. of India.
3. Jain N.K, A Textbook of Forensic Pharmacy, Vallabh Prakashan, New Delhi.
4. Singh, Harkishan "History of Pharmac y in India – Vol. I, II & III" VallabhPrakashan.

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Instrumental Analysis (Pharmaceutical Analysis-III)**	Course Code: **NA8030**
Credit: 3	L **3** T **0** P **0**
Year: **4th**	Semester: **VIII**

Study of Theory, Instrumentation, Applications and Interpretation of Data of following:

UNIT-I

UV-Visible Spectrophotometry- Theory, Instrumentation and Applications of Ultraviolet and Visible Spectrophotometry

UNIT-II

Infrared Absorption-Spectroscopy Basic principles, Instrumentation and Applications of Infrared Absorption Spectroscopy, FTIR and it's interpretation.

UNIT-III

Nuclear Magnetic Spectroscopy-An introduction to the theory of 1H-NMR, C-NMR and Solid NMR chemical shift, spin-spin coupling, shielding & deshielding Applications of NMR spectroscopy and it's interpretation

UNIT-IV

Mass Spectrometry - LCMS,GCMS Introduction to mass spectra, instrumentation, applications and it's interpretation, Types of peak in mass spectra, fragmentation pattern of some simple compounds .Interpretation of any Four API

UNIT-V

Chromatographic Techniques-Basic principles, Instrumentation and Applications of Gas Chromatography (GC) High Performance Liquid Chromatography (HPLC),UPLC

Study of Standardisation of Lab Chemicals

List of Experiments (NA8110)

1. Pharmacopoeial Analysis of any 3 API snd and dosage forms by UV and HPLC method
2. Interpretation of spectra data (Mass NMR ,IR,GC,LCMS) of any 3 API and synthetic polymer

Reference Books:

1. Pharmacopoeia of India, Ministry of Health, Govt. of India.
2. Beckett, A H and Stenlake, J.B, Practical Pharmaceutical Chemistry, Vol I and II, The Athlone Press of the University of London.
3. Willard H.H. and Merrit L. Jr and Dean J.A., Instrumental methods of Analsis Van Nostrand Renhold, New York.
4. Silver stein RM & Webster FX, Spectrometric Identification of Organic Compounds, John Wiley & Sons.
5. Skoog V, Principles of Instrumental Analysis, Holler-Neimen.

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Medicinal Chemistry – II (Pharmaceutical Chemistry-VII)**	Course Code: **NA8040**
Credit: 3	L **3** T **0** P **0**
Year: **4th**	Semester: **VIII**

Mode of action, uses, SAR of the following classes of drugs included in latest edition of Pharmacopoeia (Synthetic Procedures and Assay of individually mentioned drugs only)

UNIT-I

Steroids and related drugs: Special emphasis on Nomenclature of steroids
(A) Androgens and Anabolic steroids – Testosterone
(B) Estrogens and Progestogens – Progesterone, Estradiol
(C) Adrenocorticoids – Prednisolone
(D) Oral Contraceptives

UNIT-II

Introduction, Classification, Mode of action, uses, structure-activity relationship of the following classes of drug Synthetic procedures of individually mentioned drugs only). **Antibiotics-** Penicillin, Aminoglycosides , Tetracyclines, Cephalosporins, Chloramphenicol.

UNIT-III

Introduction, Classification, Mode of action, uses, structure-activity relationship of the following classes of drug Synthetic procedures of individually mentioned drugs only).
Antimycobacterial Agents: PAS,, Isoniazid, Dapsone Antibacterials – Sulphamethoxazole, Sulphadiazine, Sulphacetamide. Vitamins: Structure, Storage, Uses and their biochemical role in health promotion

UNIT-IV

Introduction, Classification, Mode of action, uses, structure-activity relationship of the following classes of drug Synthetic procedures of individually mentioned drugs only).
Antimalarials: Chloroquine, Primaquine
Antiamoebics: Metronidazole, Tinidazole Anthelmintics- Mebendazole

UNIT-V

Introduction, Classification, Mode of action, uses, structure-activity relationship of the following classes of drug (Synthetic procedures of individually mentioned drugs only).
Anti- HIV agents-Zidovudine
Antivirals – Amantadine, Acyclovir, Prostaglandins – Misoprostol, Carboprost.

Text Books:

1. Delagado J N and Remers W A R, Eds., Wilson And Giswold's Text book of Organic Medicinal Pharmaceutical Chemistry, J. Lippincott Co., Philadelphia.
2. Foye W C, Principles of Medicinal Chemistry, Lea & Febiger, Philadelphia.
3. Wolff ME, Ed. Burger's Medicinal Chemistry, John Wiley & Sons, New York.
4. Harkrishan and Kapoor, V.K., Organic Pharmaceutical Chemistry, Vallabh Prakashan, Delhi.
5. Patrick G L. Medicinal Chemistry, Oxford University Press NY
6. Vardanayan R. Synthesis of Essential Drugs, Acacdemic press an imprint of Elsevier
7. Pharmacopoeia of India, Ministry of Health, Govt. of India.
8. Razdan B.K. Medicinal Chemistry, CBS Publication, New Delhi
9. Application of soil survey in Irrigation Water Management, Publication no. 21, WALMI, Aurangabad (Maharastra).

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Industrial Psychology**	Course Code: **NA8050**
Credit: 3	L T P **3 0 0**
Year: **4th**	Semester: **VIII**

UNIT-I

INTRODUCTION TO INDUSTRIAL PSYCHOLOGY

1. Definitions, History & Scope of Industrial Psychology.
2. Major influences on Industrial Psychology-
3. Classical Approaches (Scientific Management)
4. Neo-Classical Approaches (Hawthorne Experiments)

UNIT-II

INDIVIDUAL BEHAVIOR AT WORKPLACE

1. Emotional Quotient
2. Job Satisfaction–Job related attitude: Job Satisfaction; Satisfaction with regards to pay and supervision,
3. Measuring Job Satisfaction: Job Descriptive Index, Minnesota Satisfaction Questionnaire.
4. Relationship of Job Satisfaction with Productivity, Absenteeism and Attrition.
5. Motivation-Meaning and Concept of Motivation,
6. Theories of Motivation; Need Theories (Maslow McClelland and Herzberg). Cognitive Theories (Goal Setting Theory, Self-Efficacy Theory).

UNIT-III

WORK ENVIRONMENT

1. Organizational Culture- Meaning and Types, Influence of Organizational Culture on Employees.
2. Leadership- Nature, Style and Approaches to Leadership
3. Group dynamics
4. Change Management

UNIT-IV

PERFORMANCE MANAGEMENT

1. Job Analysis and Learning,
2. Training and Development- Objectives and Needs, Training Process
3. Methods of Training, Tools and Aids, Evaluation of Training Programs.
4. Methods of Performance Appraisal

UNIT-V

STRESS AND CONFLICT MANAGEMENT

1. Stress Management- Meaning, Causes, Types,
2. Work and Mental Health; Fatigue. Boredom, Accidents and Safety,
3. Everyday Stress and its management-Refuting Irrational Ideas, Rational Emotive Behavioral Therapy, Goal Setting and Time Management, Facing Worry and Anxiety.
4. Conflict–Definition, Traditional Vs. Modern view of conflict,
5. Types of Conflict – Intra personnel, Interpersonal, Organizational, Constructive and Destructive Conflict, Conflict Management

Text Book:

1. Miner J.B. (1992) Industrial/Organizational Psychology. N Y: McGraw Hill.

Reference Books:

1. Blum & Naylor (1982) Industrial Psychology. Its Theoretical & Social Foundations CBS Publication.
2. Aamodt, M.G. (2007) Industrial/Organizational Psychology: An Applied Approach (5th edition) Wadsworth/ Thompson: Belmont, C.A.
3. Aswathappa K. (2008). Human Resource Management (fifth edition) New Delhi: Tata McGraw Hill.
4. Robbins, S.P. &Sanghi, S. (2009). Organizational behavior (11th ed.). New Delhi: Pearson Education.
5. Schultz, D. and Schultz, S. E. (2006). *Psychology and work today*. 8th ed. N.D.: Pearson Education

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Novel Drug Delivery Systems (*Elective*)**	Course Code: **NA8910**
Credit: 3	L **3** T **0** P **0**
Year: **4th**	Semester: **VIII**

UNIT-I

Theory of controlled release drug delivery systems. Release and diffusion of drugs from C.D.D.S., General methods of design and evaluation of C.D.D.S.

UNIT-II

Carriers for drug delivery systems, Prodrugs, Physical, chemical and biomedical engineering approach to achieve controlled drug delivery**.**

UNIT-III

Transdermal drug delivery systems: Theory, formulation and evaluation, ionotophoresis. Implants and inserts: Types, design and evaluation methods, Osmotic pumps.

UNIT-IV

Targeted Drug delivery systems: Concept of drug targeting, importance in therapeutics, methods in drug targeting, drug immobilization techniques, nanoparticles, liposomes, niosomes, pharmacosomes and resealed-erythrocytes**.**

UNIT-V

Advances in drug delivery systems:- An Introduction to buccal, nose to brain, ocular, pulmonary colonic delivery, transmucosal and stemceuticals, Trans soft palatal drug delivery and trans ungual drug delivery, Gastroretentive drug delivery system

Recommended Books:

1. Julian, Drug Delivery Systems.
2. Robinson and Vincent, Controlled Drug Delivery.
3. Robinson, Sustained and Controlled Drug Delivery Systems.
4. Noxon, Microencapsulation.
5. Chien, Novel Drug Delivery Systems.
6. Deasy, Microencapsulation and Related Processes.
7. Gutcho, Microencapsulation and Related Processes.
8. Lisbeth, Illum & Davis, Polymers in Controlled Drug Delivery.
9. Ghosh, Premamoy "Polymer Science & Technology".

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Pharmaceutical Marketing** ***(Elective)***	Course Code: **NA8920**
Credit: 3	L **3** T **0** P **0**
Year: **4th**	Semester: **VIII**

UNIT-I

Principles of marketing management, Introduction to pharmaceutical marketing, Identification of the marketing, Market behaviour, Prescribing habits of physician, Patient motivation, Market analysis.

UNIT-II

Market Research: Measuring & Forecasting Market Demand - Major concept in demand measurement, Estimating current demand Geo-demo- graphic analysis. Estimating industry sales. Market share and future demand. Market segmentation & Market targeting.

Drug development and the marketing research interface, Diversification and specialization, Marketing generic drugs..

UNIT-III

Economic and competitive aspects of pharmaceutical industry- Advertising, Detailing, Retail competition, International marketing.

UNIT-IV

Distribution channels in pharmaceutical marketing – Manufacturer, Wholesaler, Retailer, Hospital & Government agencies, Selection of stockists and distributors

UNIT-V

Controls: Internal control and external control.

Recommended Books:

1. Smith, Mickey C, "Principles of pharmaceutical marketing", CBS Publishers & Distributors.
2. Kotler, Philip "Marketing Management". Pearson Education Asia.

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Pharmaceutical Packaging** ***(Elective)***	Course Code: **NA8930**
Credit: 3	L **3** T **0** P **0**
Year: **4th**	Semester: **VIII**

UNIT-I

Concepts in pharmaceutical packaging. Package systems, package design research, package design for international transit

UNIT-II

Packaging materials with special reference to polymers, metals, glass and plastics, control of packaging materials and their specifications, Blister and strip packaging materials, their testing and specifications including microbiology

UNIT-III

Testing of containers & closures, Pharmacopoeial tests and specifications, Defects in packages. Stability of package and packaging material Ancillary materials used in packaging, their design and specifications

UNIT-IV

Sterilization of packaging materials, post-sterilization testing Packaging of Parenterals, Ophthalmics, aerosols and testing Corrugated fiber board materials, Printing requirements, label and leaflets preparation, Legal requirement as per D &C rules and rules of importing countries, testing of packaging materials and their transit worthiness

UNIT-V

Mechanization of packaging operation, use of bar codes and controls on-inline packing, testing of finished packs as per ICH guidelines , packaging materials and product mix-up, their investigations and corrective & punitive action (CAPA)

Recommended Books:

1. Ross, Packaging of Pharmaceuticals.
2. Joseph D.O. Brien, Medical Device Packaging Handbook.
3. Griffin, Drug and cosmetic Packaging.
4. Barail, Packaging Engineering.
5. Harburn, Quality-Control of Packaging Materials in Pharmaceutical Industry.
6. Kac Chensney, Packaging of Cosmetics and Toiletories.
7. USP
8. BIS specifications

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Computer Aided Drug Design (CADD)** *[Elective]*	Course Code: **NA8940**
Credit: 3	L **3** T **0** P **0**
Year: **4th**	Semester: **VIII**

UNIT-I

Computer Assisted Drug Design (Cadd) And Chemometrics :- Explanation of some basic terms , Pharmacophore, Lock-Key principle and induced fit theory , Molecular Recognition and Molecular Docking ,Solvent modeling - the role of water The dynamic aspect of modeling ,Orgin and current status ,Multivariate Data , Definitions Organization and classification of data ,Preprocessing ,Distances between objects , Latent variables , Linear Methods ,Projection of multivariate data ,Principal component analysis (PCA), Multiple linear regression (MLR) and principle component regression, Partial least squares method (PLS)

UNIT-II

2d-Quantitative Structure-Activity Relationships (2d-Qsar) Definition ,QSAR methodology Basic concepts of QSAR 1 Molecular descriptors , Electronic parameters , Polar interactions, Steric paramters, Topological paramters ,Quantum-chemical descriptors ,Biological parameters, 2D-QSAR in drug design , Validation of QSAR models ,Conclusions

UNIT-III

3d-Qsar; Comparative Molecular Field Analysis (Comfa) And - Similarity Analysis (**Comsia)** 3-QSAR 11/1 Assumptions in 3D-QSAR, CoMFA methodology Steps of a CoMFA analysis ,Pharmacophore hypothesis and alignment , Superposition of all molecules , Box, Grid size and 3D field calculations , Derivation of the CoMFA model , CoMFA coefficient maps Validation of results An example: CBG and TBG binding affinities of steriods , CoMFA application in drug design, overview

UNIT-IV

CADD: METHODS and STRATEGIES Lead discovery ,Irrational drug design and combinatorial chemistry, Computer Assisted Drug Design, Fundamentals and Application ,Virtual screening Structure-based ligand design: Pharmacophore generation ,Structure-based ligand design , Determination of a pharmacophore ,The active analog approach (AAA) ,Ensemble distance geometry

UNIT-V

PROTEIN MODELING The Protein Data Bank, Relationship between sequence and 3D structure of a protein Alignment of protein sequenc, Needleman-Wunsch alignment method,Multiple sequence alignments, Homology modeling of proteins ,Construction of the core ,Construction of loops and turns Construction of the Side chains ,Refinement of the homology model ,Prediction of protein structures by threading, Comparison of various strategies in homology modeling ,Protein folding

Recommended Books:

1. E.J, Ariens: Drug Design, Academic Press, New York (1975).
2. S.H. Salkovisky, A.A. Sinkula and S.C. Valvani, Physical Chemical Properties of Drugs, Marcel Dekker Inc. New York.
3. M.E. Wolff, Burger's Medical Chemistry, John Willey and Sons, New York.
4. R.F, Doerge, Wilson and Gisvold's Text Book of Organic Medicinal and Pharmaceutical Chemistry, J. Lippincott Co, Philadelphia.
5. Olson, Edward C "Computer Assisted Drug Design (American Chemical Society).
6. Burger A "A guide to chemical basis of Drug Design "John Wiley & Sons".
7. Thomas J.Perun "Computer aided Drug Design methods Applications".

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Advanced Clinical Pharmacy** *(Elective)*	Course Code: **NA8950**
Credit: 3	L **3** T **0** P **0**
Year: **4th**	Semester: **VIII**

UNIT-I

Introduction to stem cell biology & its implication in modern medicine. Recombinant DNA technology with reference to insulin.

UNIT-II

Basic pathology of bacterial and viral infections, Sensitivity screening for common pathogenic micro-organisms, its significance, Superbugs, resistance in disease states and selection of appropriate anti-microbial regimens.

UNIT-III

Rational prescribing and prescription monitoring. Therapeutic and toxic potential of OTC products. Drug information services.

UNIT-IV

Concept of gene therapy, Antisense therapy, basic concepts, mechanism of antisense therapy, examples of antisense therapy for treatment of different disease

UNIT-V

Case study and its interpretation of any 5 most common diseases (Cancer, Diabetes, Hypertension, Peptic Ulcer and Asthma) and their treatment and prevention.

Recommended Books:

1. Pathologic basis of diseases- Robins SL, W.B. Saunders publication.
2. Pathology and therapeutics for pharmacists: a basis for clinical Pharmacy Practice.
3. Green and Harris, Chapman and Hall Publication.
4. Clinical Pharmacy and therapeutics- Eric Herfindal, Williams and Wilkins Publication.
5. Applied Therapeutics: the clinical use of drugs. Lloyd Young and Kota-Kimble MA.
6. Avery's drug treatment, Adis international Limited.
7. Relevant review articles from recent medical and pharmaceutical literature.
8. Hospital Pharmacy – Hassan WE. Lee and Febiger publication.
9. Textbook of hospital pharmacy – Allweed MC and Blackwell.
10. Avery's Drug Treatment, Adis international limited.
11. Evidence based medicine: How to practice and teach EBM. Sharon E Straus, 3rd Ed. Churchill Livingston.
12. Basic skills in interpreting laboratory data – Scott LT, American Society of Health System Pharmacists, Inc., USA.
13. Practice Standards and Definitions. The Society of Hospital Pharmacists of Australia.
14. Clinical Pharmacokinetics – Rowland and Tozer, Williams and Wilkins Publicaiton.
15. Biopharmaceutics and Applied Pharmacokinetics – Leon Shargel, Prentice Hall publication.
16. Relevant review articles from recent medical and pharmaceutical literature.

Faculty of Pharmacy
Course Structure for B.Pharm.
Batch: 2016-20

Course Title: **Industrial Pharmacognosy** ***(Elective)***	Course Code: **NA8960**
Credit: 3	L **3** T **0** P **0**
Year: **4th**	Semester: **VIII**

UNIT-I

World wide Trade :

a) Herbal crude drugs and extracts
b) Herbal medicinal formulations
c) Herbal nutraceuticals
d) Herbal cosmetics and formulations.

UNIT-II

Quality assurance in Herbal Drug Industry. Concept of TQM., GMP, GLP and HACCP in Traditional System of Medicine.

UNIT-III

Herbal based industries: Types, scope and applications. Study of infrastructure for different types of industries involved in making standardized extracts and various dosage forms including traditional Ayurvedic dosage forms and modern dosage forms.

UNIT-IV

Design of Ayurvedic dosage forms Quality Assurance and Quality Control parameters for evaluation: solid, liquid and semi solid dosages forms. (Any two Ayurvedic formulations) for each type.

UNIT-V

Patents:

A) Indian and International' patent laws, proposed amendments as applicable to herbal/natural products and processes; important points to be kept in mind while drafting and filing a patent.

B) Plant breeders rights

Recommended Books:

1. Quality Control of Herbal Drugs by Pullok K. Mukharjee, 1st Edition, Business Horizon Pharmaceutical Publisher, New Delhi, 2002.
2. Indian Hearbal Pharmacopoeia, vol. 1 & 2, RRL, IDMA, 1998, 2000 (Current Edition)
3. Standardization of Botanicals by V.Rajpal, Vol.1, Eastern Publisher, New Delhi
4. PDR for Herbal Medicines, 2nd edition, medicinal economic company, New Jersey, 2000.
5. Poucher: "A Text Book of Cosmetics".
6. Herbal Drug Industry by R.D. Choudhary, 1st edition, Eastern Publisher, New Delhi
7. Trease and Evans Pharmacognosy by W C Evans, 15th Edition W.B Saunders E

DIT UNIVERSITY
Dehradun

Course Structure & Detailed Syllabus

of

B. Tech. in Civil Engineering

Batch 2016-20

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Year: 1st **Semester: I**

Course Code	Course Title	L	T	P	Credit
JA1010	Engineering Mathematics-I	3	1	0	3.5
BA1210	Engineering Chemistry	3	1	2	4.5
EA1210	Introduction to Electrical Engineering	3	1	2	4.5
FA1210	Introduction to Electronics & Communication	3	1	2	4.5
HA1210	Professional Communication-I	3	1	0	3.5
DA1210	Computer Fundamental & C Programming	3	0	2	4
LA1110	Workshop Practice	0	0	2	1
	Total				**25.5**

Year: 1st **Semester: II**

Course Code	Course Title	L	T	P	Credit
JA2010	Engineering Mathematics-II	3	1	0	3.5
OA1210	Engineering Physics	3	1	2	4.5
LA1210	Essentials of Mechanical Engineering	3	1	2	4.5
HA2210	Professional Communication-II	3	0	1	3.5
DA2210	Computer Programming in C++	3	0	2	4
BA1010	Environmental Science	2	0	0	2
LA1220	Engineering Graphics	1	0	2	2
HA1310	Soft Skills Development	0	0	2	1
	Total				**24**

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Year: 2nd **Semester: III**

Course Code	Course Name	L	T	P	Credits
CA3210	Fluid Mechanics	3	1	2	4.5
CA3220	Building Material and Construction	3	1	2	4.5
CA3230	Basic Surveying	3	1	2	4.5
CA3010	Solid Mechanics	3	1	0	3.5
CA3020	Environmental Engineering - I	3	1	0	3.5
JA3010	Engineering Mathematics III	3	1	0	3.5
CA3110	Building Planning & Drawing	0	0	2	1
	Total				**25**

Year: 2nd **Semester: IV**

Course Code	Course Name	L	T	P	Credits
CA4210	Hydraulics & Hydraulic Machines	3	1	2	4.5
CA4220	Advanced Surveying	3	1	2	4.5
CA4230	Concrete Technology	3	1	2	4.5
CA4240	Engineering Geology	3	1	2	4.5
CA4010	Structural Analysis - I	3	1	0	3.5
CA4020	Hydrology	3	1	0	3.5
CA4410	Industrial Tour	0	0	2	1
	Total				**26**

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
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Year: 3rd **Semester: V**

Course Code	Course Name	L	T	P	Credits
CA5210	Transportation Engineering - I	3	1	2	4.5
CA5220	Environmental Engineering II	3	1	2	4.5
CA5230	Soil Mechanics	3	1	2	4.5
CA5010	Design of Reinforced Concrete Elements	3	1	0	3.5
CA5020	Structural Analysis - II	3	1	0	3.5
GC5010	Engineering Economics	2	0	0	2
CA5310	Aptitude Building I	0	0	2	1
	Total				**23.5**

Year: 3rd **Semester: VI**

Course Code	Course Name	L	T	P	Credits
CA6010	Design of Reinforced Concrete Structures	3	1	0	3.5
CA6020	Design of Steel Elements	3	1	0	3.5
CA6030	Foundation Engineering	3	1	0	3.5
CA6040	Transportation Engineering - II	3	1	0	3.5
HA5010	Principles of Management	2	0	0	2
CA6110	Project Phase - I	0	0	4	2
CA6120	Structural Analysis Lab	0	0	2	1
CA6310	Aptitude Building II	0	0	2	1
CA6320	Value Addition Training	0	0	2	1
	Total				**21**

Department of Civil Engineering
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Year: 4th **Semester: VII**

Course Code	Course Name	L	T	P	Credits
CA7010	Bridge Engineering	3	1	0	3.5
CA7020	Estimation and Costing	3	1	0	3.5
CA7030	Water Resources Engineering	3	1	0	3.5
CA7040	Construction Management	3	1	0	3.5
	Elective - I	3	1	0	3.5
CA7110	Project Phase - II	0	0	4	2
CA7510	Industrial Training and Presentation	0	0	8	4
	Total				**24.5**

List of Elective-I for VII Semester

CA7610	Pre-stressed Concrete
CA7620	Ground Water Engineering
CA7630	Environmental Risk Assessment and Disaster Management

Year: 4th **Semester: VIII**

Course Code	Course Name	L	T	P	Credits
	Open Elective	3	0	0	3
	Elective - II	3	1	0	3.5
	Elective - III	3	1	0	3.5
	Elective - IV	3	1	0	3.5
	Elective - V	3	1	0	3.5
CA8110	Project Phase - III	0	0	8	4
	Total				**21**

List of Elective-II, III, IV Courses for VIII Semester

Elective II	CA8610	Hydraulic Structures
	CA8620	Hydro Power Engineering
	CA8630	River Engineering
	CA8640	Water & Land Management
Elective III	CA8650	Air & Water Pollution
	CA8660	Environmental Management & Sustainable Development
Elective IV	CA8670	Seismology & Earthquake Engineering
	CA8680	Advanced Structural Design
	CA8690	Finite Element Analysis
	JA4610	Numerical Techniques
Elective V	CA8600	Traffic Engineering & Management
	CA86A0	Advanced Highway Engineering

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20
List of Open Electives (To be conducted in VIII Semester)

Sl. No.	Branch	Subject Code	Name of Elective subjects
1	Physics	OA8710 OA8720	1. Nano Scale Science and Technology 2. Photonics Technology
2	EE	EA8710 EA8720	1. Non-Conventional Energy Resources 2. Instrumentation and Process control
3	ME	LA8710 LA8720	1. Entrepreneurship development 2. Quality Management
4	Civil	CA8710 CA8720	1. Environment and Ecology 2. GIS
5	CSE	**DA8740** DA8710	1. Management Information System (MIS) 2. Business Intelligence
6	IT	IA8730 IA8721	1. Internet of Things 2. IT In Business
7	ECE	FA8710	1. Consumer Electronics
8	Humanities	HA8710 HA8720	1. Industrial Psychology 2. Human Values and Ethics
9	MBA	GA8710 GA8730 GA8740	1. Organizational Behavior 2. Digital Marketing 3. Financial Modeling with Spread sheet

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Engineering Mathematics-I**	Course Code: **JA1010**
Credit: **3.5**	L **3** T **1** P **0**
Year: **1st**	Semester: **I**

UNIT I: Differential Calculus-I [**9**]

Functions of single variable: Limit continuity and differentiability; Indeterminate forms; Mean value theorems; Role's Theorem; Taylor's theorem with remainders; Curve tracing.

UNIT II: Differential Calculus-II [**9**]

Successive differentiation; Leibnitz theorem; Partial differentiation; Euler's theorem; Expansion of functions of several variables; Extrema of functions of several variables; Lagrange's method of multipliers.

UNIT III: Integral Calculus [**9**]

Improper integral-Beta and Gamma functions; Double and Triple integrals; change of order of integration; change of variables; Dirichlet's integral and its applications; Application of multiple integral.

UNIT IV: Vector Calculus [**12**]

Vector Differentiation: Scalar and vector fields; gradient of scalar point function; directional derivatives; divergence and curl of vector point function; solenoidal and irrotational vectors.

Vector Integration: line, surface and volume integrals; Green's theorem; Stokes' theorem and Gauss divergence theorem (without proof).

Text Books:

- R. K. Jain & S. R. K. Iyenger, **Advanced Engineering Mathematics**, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.

Reference Books:

- E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, John &Wiley Sons, U.K., 2006.
- B. S. Grewal, **Higher Engineering Mathematics**, 42th Edition, Khanna publication, New Delhi, India, 2012.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Engineering Chemistry**	Course Code: **BA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **I / II**

UNIT – I

Water Chemistry

Introduction, Analysis of Water – Alkalinity, Chlorides and Dissolved Oxygen, Hardness of Water - Temporary and Permanent hardness, Estimation of hardness by EDTA Method, Disadvantages of Hard Water, Numerical problems.

Water for Industrial purpose – Boiler Feed Water, Boiler Troubles (Priming and Foaming, Boiler Corrosion, Scales and Sludges, Caustic Embrittlement), Water Treatment: Internal Treatment (Colloidal, Phosphate, Calgon, Carbonate Conditioning), External Treatment (Lime-Soda Process, Zeolite Process, Ion- Exchange Process), Numerical Problems.

UNIT – II

Physical Chemistry

Electrochemistry: Reference electrodes, Ion selective electrodes, Chemically modified electrodes as sensors, Electrochemical energy systems, Lithium batteries, Fuel cells.

Thermochemistry: Hess's Law, Heat of a reaction, Effect of temperature on heat of reaction at constant pressure (Kirchoff's eq.), Heat of dilution, Heat of hydration, Heat of neutralization and Heat of combustion.

Surface chemistry: Surface and interfacial tension, Capillary pressure.Adsorption phenonmenon, Adsorption of gaseson solids, Frendlich and Langmuir adsorption isotherms,Role of adsorbents in catalysis, ion-exchange and pollution abatement.

UNIT – III

Science of Corrosion and Protective Coatings

Introduction, Types of Corrosion, Theories of Corrosion and Mechanism, Factors Influencing Corrosion.Control of Corrosion.

Types of Protective Coatings: Metallic Coatings, Anodic Coatings, Galvanization, Cathodic Coatings, Tinning, Metal Cladding, Electroplating (Chromium Plating, Metal Spraying, Cementation-Sheradizing, Colourizing, Chromizing).

UNIT – IV

Introduction to Polymers and Nano-materials

Polymerization, Classification of polymers, Addition and Condensation Polymerizations. Plastics - Thermosetting and Thermoplastics. Preparation, Properties and Uses of Polyethylene, PVC, Teflon, Bakelite, Nylon, Polyester, Polyurethane, Ziegler-Natta catalyst, conducting polymers.Rubber-Processing of Natural Rubber, Vulcanization and Compounding. Elastomers: Buna-S, Buna- N, Thiokol.

Introduction to Nano-materials: Fullerenes, Nano-tubes, Nano-wires, Nano-cones, Nano-dots, Nano-sphere, Haeckelites. Their electronic and mechanical properties, Production methods for CNTs. Applications of nano materials in i) Medicine ii) Catalysis iii) Environmental Technologies iv) Electronics& related fields. v) Mechanics.

UNIT – V

Fuels & Lubricants

Fuels: Classification, crude oil: composition and fractionation, Octane & Cetane Number and their significance; calorific value of fuel, Determination of calorific value of fuels, bomb calorimeter, Solid fuels - Proximate and ultimate analysis, Numericals problems.

Lubricants: Functions of lubricants, Mechanism of Lubrication (thick film or hydrodynamic lubrication, thin film or boundary lubrication, extreme pressure lubrication), Classification and properties of

lubricants-Viscosity, Flash and fire point, Cloud and pour point, Aniline point, Neutralization number and mechanical strength. Numerical problems on acid value and saponification value.

Text Books:

1. Chemistry in Engineering & Technology (Vol I & II) (Latest ed.) By J.C. Kuriacose& J. Rajaraman, Tata McGraw-Hill Co, New Delhi.
2. Engineering Chemistry by O.G. Palanna, Tata McGraw-Hill Co, New Delhi.

Reference Books:

1. Atkins' Physical Chemistry by Peter W. Atkins and Julio de Paula, Oxford University Press.
2. Principles of Physical Chemistry (Latest ed.) By Puri, Sharma & Pathania.
3. Organic chemistry, Morrison and Boyd, Pearson Prentice Hall, 2011
4. Environmental chemistry, S.E. Manahan, 9th edition, CRC Press.
5. Textbook of polymer science by F.W. Billmeyer, Wiley India.

Engineering Chemistry Lab

List of Experiments

1. Estimation of hardness of water by EDTA method
2. Estimation of total alkalinity in the given water sample.
3. Estimation of dissolved oxygen in the given water sample.
4. Estimation of available chlorine in the given sample of bleaching powder.
5. pH-metric titration.
6. Determination of viscosity of lubricants by Redwood viscometer / Ostwald's viscometer.
7. Determination Surface Tension of lubricants.
8. Determination of Flash point of a given oil by Pensky_Marten's flash point approach.
9. To Determine Saponification-value of the given Lubricating Oil.
10. To Determine Acid-Value of the given Lubricating Oil.
11. To determine the moisture, volatile and ash contents in a given coal sample by proximate analysis.
12. To study the adsorption of acetic acid on activated charcoal.

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Course Title: **Introduction to Electrical Engineering**	Course Code: **EA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **I / II**

UNIT – 1
D.C. NETWORK THEORY
Review of basic circuit theory concepts, Mesh and Nodal analysis, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Star–delta transformation, Magnetic Circuits.

UNIT – 2
A.C. CIRCUITS & MEASURING INSTRUMENTS
*Single Phase A.C.:*Phasor representation of voltage and current, A.C. circuit behavior of resistance, inductance, capacitance & their combination in series and parallel, Power triangle, Power factor, Concept of series & parallel resonance.
*Three Phase A.C.:*Star – delta connections, Relation between line and phase quantities, three phase power and its measurement, What is 3 phase 4 wire and 3 phase 5 wire system?
Measuring Instruments: Construction and principle of voltage and current measuring instruments.

UNIT – 3
TRANSFORMERS
Principle of operation, Types of construction, Phasor diagram, Equivalent circuit, Efficiency and voltage regulation of single phase transformer, O.C. and S.C. tests.

UNIT – 4
D.C. & SYNCHRONOUS MACHINES
D.C. Machines: Construction and working principle of d.c. generator and d.c. motor, Types of d.c. machines, E.M.F. equation, Torque equation, Magnetization and load characteristics, Losses and efficiency, Need of starter in d.c. motors.
Synchronous Machines: Construction and Principle of operation of Alternator and Synchronous Motor.

UNIT – 5
INDUCTION MOTORS
Three Phase Induction Motors: Principle of operation of 3-Ø induction motor, Types of 3-Ø induction motor, Need of starters in 3-Ø induction motors, Slip – torque characteristics,
Single Phase Induction Motor: Principle of operation of single phase induction motor, Methods of starting of single phase induction motor.

Reference Books:
1. V. Del Toro. " Principles of electrical Engineering, "Prentice hall International.
2. W.H. Hayt& J.E. Kemmerly," Engineering circuit Analysis, "McGraw Hill.
3. I. J. Nagrath, "Basic Electrical Engineering," Tata Mc. Graw Hill.
4. A. E. Fitgerald, D.E., Higginbotham and A Grabel, "Basic Electrical Engineering" McGraw Hill
5. H. Cotton, "Advanced Electrical Technology" Wheeler Publishing.

Department of Civil Engineering
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Basic Electrical Engineering Lab

(Any Ten)

1. Verification of Network Theorems.
2. Study of diode characteristics. Study of phenomenon of resonance in RLC series circuit.
3. Measurement of power in a three phase circuit by two wattmeter method.
4. Measurement of efficiency of a single phase transformer by load test.
5. Determination of parameters and losses in a single phase transformer by OC and SC test.
6. Study of characteristic of DC Motor.
7. Study of characteristic of AC Motor.
8. DC generator characteristics.
9. 10. Speed control of dc shunt motor.
10. Study running and reversing of a three phase induction motor.
11. Study of a single phase energy meter.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Introduction to Electronics & Communication**	Course Code: **FA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **I / II**

UNIT 1: Fundamental of Semiconductors ***10 L***

Energy bands in semiconductors, intrinsic and extrinsic semiconductors, Fermi Level in Intrinsic and Extrinsic semiconductor, Carrier transport in semiconductors: diffusion current, drift current, mobility, Hall Effect and resistivity. Generation and recombination of carriers.

UNIT 2: Application of Low Power and High Power Diodes ***10 L***

Diode circuits: Construction, Junction diode characteristics, Half and full wave rectifiers - Expression for efficiency and ripple factor - Bridge rectifier – π Filter circuits, Clipper, Clamper and multipliers using diodes, Zener Diode Characteristics - Regulated power supply using Zener diode.

UNIT 3: Transistor fundamentals ***8 L***

Transistor circuits: Characteristics of a transistor in CB, CE and CC modes - Relatively merits - Biasing of Transistors - Load Line and operating point concept (both AC and DC). Construction and working of JFET and MOSFET.

UNIT 4: Digital fundamentals and Introduction to Signals ***8 L***

Basic logic gates: AND, OR, and NOT – implementation of all gates using Universal gates, Number Systems conversions, Boolean algebra, K-map (upto 4 variables). Source of Information, Types of Signals.

UNIT 5: Basics of Communications & Instrumentation ***9 L***

*C*ommunication Systems, Communication Channels, Need of modulation, Types of modulations (Wave shapes and final expression only), Study of Piezoelectric, PMMC, LVDT and Strain Gauge transducers and their classifications and display device (7 segment) only.

Reference Books:

Unit 1. Electronics Devices and Circuits, Millman and Halkias, Tata McGraw Hill, 4th ed.
Unit 2 & 3. Electronic Devices and Circuit Theory, Robert L. Boylestad, Prentice Hall Higher Edu., 2000.
Unit 4. Digital Design, Morris Mano, PHI
Unit 4. Modern Digital & Analog Communications, B. P. Lathi, OUP
Unit 5. Electronic Communication Systems, John Kennedy , Tata McGraw Hill, 4th ed.
Unit 5. Electronic Instrumentation - H. S. Kalsi

ELECTRONICS ENGINEERING LAB.

1. To identify and Study of the various component and Devices of electronics with their specification (CRO, Function Generator, Multimeter, Power Supply, resistor, capacitor, inductor, ICs, LED, potentiometer etc.)
2. To study the V-I characteristics of PN diode and Zener diode.
3. To find the efficiency of Rectifiers and ripple factor of capacitive and non-capacitive half wave and full wave rectifier.
4. To Study and Verify clipper and clamper with biased circuits.
5. To find the characteristics of CB and CE amplifiers.
6. Determine the characteristics of FET.
7. To find out the power energy of various periodic and non periodic signals.
8. To verify the logic gates using diodes.
9. Study and observations of AM & FM Waveforms.
10. Study of various transducers (Strain Gauge).

***** *Plus 2-3 value added experiments can be performed.*

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Course Structure for B.Tech. (Civil Engineering)
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Course Title: **Professional Communication – I**	Course Code: **HA1210**
Credit: **3.5**	L **3** T **1** P **0**
Year: **1st**	Semester: **I**

UNIT 1: **COMMUNICATION** **(6 Hrs)**

1. Communication: Definition and Process of Communication.
2. Types of Communication: Formal and Informal Communication, Verbal and Non-Verbal Communication.
3. Barriers to Communication: Intrapersonal and Interpersonal Barriers. Semantic Barriers, Physical Barriers, Psychological Barriers, and Organizational Barriers.

UNIT 2: **LISTENING SKILLS & SPEAKING SKILLS** **(8 Hrs)**

1. Importance and Objective of Listening Skills, Process of Listening, Listening and Hearing, Types of Listening, and Methods for Improving Listening Skills
2. Listening Comprehension: Identifying General and Specific Information.
3. Listening for Note taking and drawing Inferences.
4. Importance of Speaking Skills, Types of Speaking, Methods for Improving Speaking Skills
5. Introduction to Phonetic Transcription: Familiarization with British and American Usage.

UNIT 3: **READING SKILLS** **(4 Hrs)**

1. Importance of Reading Skills, Types of Reading Skills, Methods of Improving Reading Skills.
2. Vocabulary Building: Antonyms, Synonyms, Homophones, Homonyms, and One-Word Substitution, Etymology and roots.

UNIT 4: **WRITING SKILLS** **(10 Hrs)**

1. Importance of Writing Skills, Types of Writing Skills, and Methods for Improving Writing Skills.
2. Sentence and Paragraph Construction. Writing Expository, Argumentative and Deductive Order etc Paragraphs.
3. Précis Writing
4. Basic Letter Writing: Format and Style of Formal Letters.

UNIT 5: **ONE ACT PLAY** **(6 Hrs)**

Practice of LRSW through the study of the one act play, ***THE REFUND*** by **Fritz Karinthy**.

TEXT BOOK

1. Gupta, Ruby. Basic Technical Communication, Cambridge University Press, New Delhi.2012.

REFERENCE BOOKS

1. Rizvi, Ashraf. Effective Technical Communication, McGraw Hill, New Delhi. 2005
2. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011
3. Tyagi, Kavita& Padma Misra. Basic Technical Communication, PHI, New Delhi. 2011
4. Lewis, Norman. Word Power Made Easy, W.R Goyal Pub. & Distributors.1995
5. Ford A, Ruther. Basic Communication Skills; Pearson Education, New Delhi.2013
6. Aslam, Mohammad. Introduction of English Phonetics and Phonology Cambridge.2003
7. Kameswari, Y. Successful Career Soft Skills and Business English, BS Publications, Hyderabad.2010
8. English Pronouncing Dictionary, Cambridge.2012
9. The Oxford Guide to Writing and Speaking. OUP, Delhi.2011

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Professional Communication – I Lab

Lab 1	Neutralization of Mother Tongue Influence through manner of articulation
Lab 2	Common Errors in English and Indianisms.
Lab 3	Introduction to Speech Sounds – Practicing Vowel and Consonant sounds
Lab 4	Syllable, word stress, Sentence stress
Lab 5	Pause group, Intonation & Rhythm
Lab 6	Functional English
Lab 7 & 8	Everyday Conversation : Greetings, Apologies, Requests, At a Restaurant, Shopping, Groceries, Hiring an Apartment, Travel Courses, etc.
Lab 9	Developing Listening skills through cultural movies
Lab 10 &11	Movie - To provide exposure to the target language
Lab 12	Final evaluation based on Extempore

References: (Software and Videos)

1. Wordsworth English Language laboratory software
2. Wordsworth Prep 1-2-3
3. Connected Speech Level 1-2-3
4. Learn To speak English CD 1-2-3-

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Course Title: **Computer Fundamentals and 'C' Programming**		Course Code: **DA1210**	
Credit: **4**	L **3**	T **0**	P **2**
Year: **1st**		Semester: **I**	

UNIT 1 **(8 L)**

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system: Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

UNIT 2 **(8 L)**

Standard I/O in C, Fundamental data types- Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external**,** Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Fundamentals of C programming: Structure of C program**,** writing and executing the first C program, components of C language. Standard I/O

UNIT 3 **(8 L)**

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch**,** program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break, continue and goto statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

UNIT 4 **(8 L)**

Arrays: Array notation and representation, manipulating array elements using one and two dimensional arrays, linear searching, sorting (bubble sort), strings, matrix manipulation (transpose, addition, multiplication).

Structures: Purpose and uses of structures, declaring structures, array of structures, union, enumerated data types

UNIT 5 **(8 L)**

Pointers: Pointers: pointer variables, pointer operator, pointer expression, array of pointers, multiple indirection, pointers to functions, dynamic memory allocation functions.

File handling**,** standard C preprocessors**,** defining and calling macros, conditional compilation.

Text Books:

1. YashwantKanetkar, "Let us C", BPB Publications, 2nd Edition, 2001.
2. Herbert Schildt, "C:The complete reference", OsbourneMcgraw Hill, 4th Edition, 2002.
3. Computer Fundamentals and Programming in C. ReemaThareja, Oxford Publication
4. P.K. Sinha "Computer Fundamentals" B.P.B Publication.

Reference Books:

1. Raja Raman, "Computer Programming in C", Prentice Hall of India, 1995.
2. Kernighan & Ritchie, "C Programming Language", The (Ansi C Version), PHI, 2nd Edition.
3. Byron Gottfreid "Schaum's Outline of Programming with C".

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
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List of Programs in 'C' Lab

Lab 1	(a) WAP to perform simple arithmetic operations using different data types. (b) WAP to show swap of two no's without using third variable.
Lab 2	(a) WAP to find the roots of a quadratic equation. (b) WAP to check the number is odd or even and find the sum of all odd and all even separately.
Lab 3	(a) WAP to find out whether the given number is prime or not. Find sum of all prime upto N. (b) WAP to reverse a given number and check the palindrome status.
Lab 4	WAP to print corresponding days of a week using switch case.
Lab 5	WAP to find and generate the Armstrong number.
Lab 6	WAP to print pattern triangle like Floyd's, Pascal, pyramid triangle.
Lab 7	(a) WAP to interchange two values using call by value and call by reference. (b) WAP to print factorial of a number using recursion & without using recursion.
Lab 8	WAP to print Fibonacci series. (**a**) Without using function (**b)** using function (**c)** using recursion
Lab 9	(a) WAP to print an array and find greatest/smallest element of an array. (b) WAP to perform linear searching in an array.
Lab 10	(a) WAP to insert/ delete element from an array. (b) WAP to sort the array's element using Bubble sort.
Lab 11	WAP to perform the following string functions. **a.** Strlen **b**. strcmp **c.**strcpy **d**. strcat **e**. strlwr **f.**strupr
Lab 12	Declare a suitable structure of a college and print the name and DOB of the student have scored more than sixty percent marks in end semester exam.
Lab 13	Declare a suitable structure for an organization and print all the names of employees having salary more than Rs.1000.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Workshop Practice**	Course Code: **LA1110**
Credit: **1**	L **0** T **0** P **2**
Year: **1st**	Semester: **I / II**

List of Experiments

1. Carpentry: To make a T-Lap joint with soft wood.
2. Arc Welding: To make a Lap joint with mild steel flat by arc welding process.
3. Gas Welding: To make a Lap joint of M.S. sheet with gas welding process.
4. Fitting: To make a plug and socket joint with M.S. flat.
5. Machine Shop: To turn a M.S. rod on lathe to prepare a turning specimen.
6. Sheet Metal: To make a square tray with G.I. sheet.
7. Study of Foundry and Forging tools and equipments

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Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Engineering Mathematics – II**	Course Code: **JA2010**
Credit: **3.5**	L **3** T **1** P **0**
Year: **1st**	Semester: **II**

UNIT I: **(10L)**

Linear Algebra

Matrices; Inverse of matrix; Echelon form; Rank of matrix; Consistency and solution of a system of linear equations; Linear dependence and independence of vectors; Matrix transformations; Eigen values and eigenvectors; Cayley– Hamilton theorem; Reduction to diagonal form; Vector spaces; Sub spaces; Basis; Dimension; Linear Transformation**.**

UNIT II: **(8L)**

Differential Equations

Linear differential equations first order and first degree; Linear differential Equations of higher orders with constant coefficients; Complementary functions and Particular integrals; Euler-Cauchy linear differential equations; Simultaneous linear differential equations; Method of variation of parameters.

UNIT III: **(6L)**

Infinite Series

Introduction; Sequences; Series; Convergence; Series of positive terms; Comparison test; Integral test; D'Alembert's Ratio test; Cauchy's root test; Alternating series; Leibnitz rule.

UNIT IV: **(8L)**

Fourier Series

Periodic functions; Fourier series of Periodic functions; Euler's formulae; Functions having arbitrary period; Change of intervals; Even and Odd functions; Half range sine and cosine series.

UNIT V: **(8L)**

Laplace Transform

Laplace Transform; Existence theorem; Properties of Laplace Transform ; Laplace Transform of derivatives and integrals; Laplace Transform of Periodic functions; Unit Step function and Error Function; Dirac- Delta function; Unit impulse function; Convolution theorem; Applications of Laplace Transform to solve linear and simultaneous differential equations.

Text Books:

1. R. K. Jain & S. R. K. Iyenger, **Advanced Engineering Mathematics**, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.
2. E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, John Wiley & Sons, U.K., 2006.

Reference Books:

1. W. E. Boyce and R. Di Prima, **Elementary Differential Equations**, (8th Edition), John Wiley & Sons, U.K., (2005).
2. B. S. Grewal, **Higher Engineering Mathematics**, 42nd Edition, Khanna Publication, New Delhi, India, 2012.

Department of Civil Engineering
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Course Title: **Engineering Physics**	Course Code: **OA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **I / II**

UNIT I:

Relativistic Mechanics: Inertial and Non-inertial Frames; Postulates of Special Theory of Relativity; Galilean and Lorentz Transformation; Length Contraction and Time Dilation; Addition of Velocities; Variation of Mass with Velocity and Mass Energy Equivalence.

UNIT II:

Interference: Introduction; Coherent Sources; Analytical treatment of interference; Young's double slit experiment and its analysis; Conditions of Interference; Fresnel's Biprism; fringes with white light; Determination of wavelength of monochromatic light by using Fresnel's Biprism method; Displacement of Fringes; Interference in plane parallel thin film (reflected and transmitted light) and wedge shaped film(reflected light only); Newton's Rings; Determination of wavelength of monochromatic light and determination of refractive index of a liquid by using Newton's ring method.

UNIT III:

Diffraction: Introduction; Difference between Interference and diffraction; resultant of superposition of n simple harmonic coherent vibrations; Fraunhofer diffraction due to single slit: resultant intensity; conditions of maxima; minima; angular and linear width of central maximum; Double slit diffraction: resultant intensity; missing order; N-slit diffraction : resultant intensity; conditions of maxima and minima; missing orders; angular width of principal maxima; Diffraction grating: formation of spectra and missing order spectra in spectrum; dispersive power of grating; Resolving power; Rayleigh Criterion of resolution; Resolving power of plane transmission diffraction grating.

UNIT IV:

Polarization: Polarised and unpolarised light and its pictorial representation; plane of polarisation and plane of vibration; Phenomenon of Double Refraction; positive and negative double refracting crystals; properties of ordinary and extra-ordinary Rays; Nicol Prism and its application as a polariser and analyser; Mathematical analysis of superposition of two linearly polarised light vectors; retardation plates – half wave plate and quarter wave plate; Production and detection of Plane; Circularly and Elliptically Polarized Light.

Laser: Spontaneous emission; stimulated emission and stimulated absorption; Einstein's A and B Coefficients and relation between them; Principle of Laser Action; Construction and Working of He-Ne; Semiconductor Laser.

UNIT V:

Wave Mechanics : Wave Particle Duality; de Broglie Concept of Matter Waves; Davisson and Germer experiment; Concept of wave packet; group and phase velocity; Heisenberg Uncertainty Principle and its applications viz. non existence of electron in nucleus; radius and energy of Bohr's first orbit; Schrödinger time independent and time dependent wave equation; Physical interpretation of wave function; Application of Schrodinger wave equation: Particle in a one dimensional box (eigen function and eigen values).

Introduction to Fibre Optics: Fundamental ideas about optical fiber; Types of fibers; Acceptance angle and cone; Numerical Aperture.

Text Books:

1. AjoyGhatak**; Optics;** Tata Mc-Graw Hill Education;2009.
2. Subramanyam; BrijLal;**A Text Book of Optics**; S. Chand, 2004.
3. K. Thyagarajan, AjoyGhatak; **Lasers: Fundamentals and Applications**; Second;Springer, 2010.
4. AjoyGhatak& K. Thyagarajan ;**Introduction to Fiber optics;**Cambridge University Press,1998.
5. Halliday, Resnick& Walker; **Principles of Physics**; Nineth, Wiley, India;2013

Reference Books:

1. Arthur Beiser ;**Concepts of Modern Physics**; Tata Mc-Graw Hill Education;2003.
2. Robert Resnick;**Introduction to Special theory of Relativity** ; First; John Wiley& Sons; 1968.
3. Jenkins and White ;**Fundamentals of Optics**; Fourth; McGraw-Hill;2001
4. David. J. Griffith; **An Introduction to Quantum Mechanics**;Second; Pearson prentice Hall; 2004.
5. Young and Freedman;**Sears and Zemansky's University Physics**,Tenth; Addison-Wesley, 2000.

List of Experiments

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help ofFresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locatethe position of cardinal points.
4. To determine the specific rotation of cane sugar solution using bi quartz polarimeter.
5. To determine the wavelength of spectral lines using plane transmissiongrating.
6. To determine the specific resistance of the material of given wire usingCarey Foster's bridge.
7. To determine the variation of magnetic field along the axis of a currentcarrying coil and then to estimate the radius of the coil.
8. To verify Stefan's Law by electrical method.
9. To calibrate the given ammeter using potentiometer.
10. To calibrate the give voltmeter using potentiometer.
11. To determine energy band gap of a given semiconductor material by p-n junction method.
12. To determine the viscosity of water by Poisseuille's method.

Note: Additional experiments may be added based on contents of syllabus.

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Course Title: **Essentials of Mechanical Engineering**	Course Code: **LA1210**
Credit: 4**.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **I / II**

UNIT – I **9L**

Introduction to Engineering: Difference between Science and Technology, history of wheel, introduction to prime movers, transmission system, belt, pulleys, gear system and nomenclature, braking system, Mechanism, lever mechanism, Working principle of power generation system, hydel power plant, thermal power plant and its main components.

Coplanar Force system: Resolution of force in two mutually perpendicular direction Free Body Diagram, Moment, Varignon's theorem, static equilibrium, Lami'sTheorem, type of joints/Support, Type of load: point load, uniformly constant and varying loads, beam and its type.

UNIT – 2 **7L**

Engineering material and their properties: Details of hook's law, Proportional limit, Yield point, Yield Stress, Engineering strain, Engineering stress, True stress and Strain, Plasticity, Elasticity, Allowable Strength, Hardness, Ductility, toughness, Fatigue, creep, strain energy, Impact Strength, Young modulus of Elasticity, Bulk Modulus, Poission Ration and its relation in between.

Stress and strain: Normal stress and strain, principle of Superposition, Deformation in stepped and composite bar.

UNIT – 3 **7L**

Thermodynamics: Macroscopic & microscopic study point of view, System, Surrounding and Universe, Phase, Property, State, Path, Process, Cyclic and non-cyclic processes, Quasi static process, Reversible and irreversible processes , Thermodynamic equilibrium, Concept of continuum, Energy and its forms, Enthalpy, Zeroth law, Different temperature scales and theory of temperature and Pressure measurement.

UNIT – 4 **8L**

Laws of Thermodynamics: Thermodynamic definition of work, Thermodynamic processes, Calculation of work in various processes and sign convention, Non-flow work and flow work, Joules' experiment, First law of thermodynamics, Internal energy and enthalpy, First law of thermodynamics applied to open systems, Steady flow energy equation and its applications, First law analysis for closed system (non flow processes), Limitations of first law of thermodynamics, PMM-I.

Statement of Second Law of Thermodynamics: Kelvin Planck's statement and Clausius statement and their equivalence.

UNIT – 5 **9L**

Power generation: Air standard cycle**,** IC Engine**,** Carnot cycle, Otto cycle, Diesel cycle, Important components of I.C.Engine, two stroke and four stoke engine, S.I. and C.I. engines, efficiency of Otto and diesel cycle

Basics of Heat Transfer: Concepts of the mechanisms of heat flows: conduction, convection and Radiation heat transfer application in engineering.

Reference Books:

1. Basu,A.R; A Text book of Engineering Mechanics(Applied Mechanics);2003 Edition; Dhanpat Rai & co.(p) Ltd, Delhi.
2. Chandramouli, P.N; Engineering Mechanics; Second Printing; PHI Learning Private Limited, Delhi; 2013.
3. Rajput, R. K; Material Science; S. K. Kataria & Sons, New Delhi.
4. Dubey, N. H; Engineering Mechanics, Statics and Dynamics; First reprint; McGraw Hill Education (India) Private Limited, New Delhi, 2013.
5. Ratan, S.S; Theory of machines; Second Edition; Tata McGraw Hill Publishing Company Limited, New Delhi.
6. Nag.P.K.; Engineering Thermodynamics; 3rd Edition; Tata McGraw Hill Publishing Company Limited, New Delhi.
7. Nag.P.K.; Heat and Mass Transfer; Tata McGraw Hill Publishing Company Limited, New Delhi.
8. Kumar.D.S; Basic of Mechanical Engineering; S. K. Kataria & Sons, New Delhi.

Essentials of Mechanical Engineering Lab

List of Experiments

1. Tensile test
2. Impact test
3. Hardness test
4. Pulley experiment
5. Experiment on conduction heat transfer
6. Demonstration of Impulse and reaction turbine
7. Study of 4s and 2S engine petrol Engine
8. Study of 4s and 2S engine Diesel Engine
9. Study of refrigerator and air conditioning

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Course Title: **Professional Communication – II**			Course Code: **HA2210**
Credit: **3.5**	L **3**	T **0**	P **1**
Year: **1st**			Semester: **II**

UNIT 1: **PROFESSIONAL COMMUNICATION** **(6 Hrs)**

1. Importance and Features of Business Communication, Flow and Channels of Communication in an Organization.
2. Introduction to Technical Communication, Types and History of Technical Communication.
3. Difference between General and Technical Communication, and Importance of Technical Communication.
4. Characteristic of Technical Communication, and Elements of Style.
5. Process of Preparing a Technical Document.
6. Elements and Features of Scientific Articles.
7. Compunication, E- mail, E- tools and Encyclopedia.

UNIT 2: **BUSINESS CORRESPONDENCE** **(8 Hrs)**

1. Business Correspondence – Principles, Features, Types, Format and Layout of Business Letter.
2. Inter Office Correspondence – Letters of Enquiry, Quotation, Order, Sales, and Complaint.
3. Intra Office Correspondence: Notice, Agenda, Minutes, and Memorandum.
4. Job Application Letter.

UNIT 3: **TECHNICAL PROPOSAL and TECHNICAL REPORT** **(8 Hrs)**

1. Technical Proposal - Introduction, Purpose, Features, Types, Format, Importance, and Writing Technical Proposals and Plagiarism.
2. Technical Report - Features, Types, Style, Format, Relevance, and Writing Technical Reports.

UNIT 4: CORPORATE COMMUNICATION SKILLS **(8 Hrs)**

1. Dimensions and importance of EQ
2. Interpersonal communication skills - Life Position, and Transactional Analysis
3. Johari Window: Role of Feedback and Disclosure in Communication; Accepting Criticism
4. Cross Cultural Communication
5. Attitude
6. Perception
7. Personality Attributes and Communication: Self Esteem, Self-Monitoring, Impression Management, and Locus of Control.
8. Conflict and Negotiation

UNIT 5: PROJECT **(6 Hrs)**

REPORT WRITING/ PROPOSAL WRITING

The students will write a Report **OR** a Proposal consisting of 10-15 pages.

REPORT WRITING

1. **For B.Tech. students**-
    a. Technical Report describing new machinery, a report on the sudden break down in production unit, and market survey report for formulating new market strategy.
2. **For B.Pharma. students**
    a. Technical Report based on the site inspection of a drug manufacturing unit, Survey Report on Health Awareness and Self-Medication.
3. **For B.Arch. students**

a. Technical Reports based on a Site Inspection for Geographical and Geological aspects of a particular location, A Report on the Architectural Survey of a Monument. Architectural

PROPOSAL WRITING

1. **For B.Tech. students**
   a. Technical Proposal to organize a Technical Training Program, To develop new range of a product and to start a new venture.
2. **For B.Pharma. students**
   a. Technical proposal to establish a new laboratory, To create new drug-composition and to visit to a Super Specialty Hospital.
3. **For B.Arch. students**
   a. Technical Proposal for an Archeological Site visit , To Construct New Buildings.

Report Writing and Proposal Writing carries 30 marks equivalent to three class tests.

TEXT BOOK

1. Gupta, Ruby. Advanced Technical Communication, Cambridge University Press, New Delhi. 2011.

SUGGESTED REFERENCE BOOKS

1. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011.
2. Tyagi, Kavita& Padma Misra. Advance Technical Communication, PHI, New Delhi.2011
3. Technical Communication, Cengage Learning, New Delhi.2010
4. Technical Communication, OUP, New Delhi. 2013
5. Wallace, Masters Personality Development, Cengage Learning, New Delhi.2006
6. Barrass, Robert: Students Must Write, Foundation books, Cambridge, New Delhi.2006
7. Rao, Bhaskar: Successful Career Soft Skills and Business English, BS Publications, Hyderabad.2012
8. Chakrawarthi: Soft Skills for Professionals, Wiley India.2011

Professional Communication – II Lab

Lab 1	Vocabulary Building
Lab 2	Telephone Etiquette: Making an appointment , answering Calls
Lab 3	Public Speaking
Lab 4	Group Discussion: Do's and Don'ts of GD
Lab 5 & 6	Interview Skills: Preparation
Lab 7	PP Presentation Skills: Techniques of making effective presentation
Lab 8	Meeting : Conducting meetings effectively
Lab 9	Developing Negotiating skills
Lab 10 &11	Reading Comprehension
Lab 12	Evaluation

References: (Software and Videos)

1. Wordsworth English Language laboratory software
2. Wordsworth Prep 1-2-3
3. Communicate
4. Train 2 Success
5. Additional PPTs

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Computer Programming in C++**			Course Code: **DA2210**
Credit: **4**	L **3**	T **0**	P **2**
Year: **1st**			Semester: **II**

Unit -1 **8L**

Introduction to Object Oriented Programming, including methodologies, programming techniques, Object Oriented languages.
Overview of C++ basic structures, including the main () function, C++ data types, different type of operators expressions and statements, standard Input/output, Simple flow of control, Defining user defined Functions.

Unit -2 **8L**

General overview of objects and classes, Object and classes in C++, including class definition, Defining members inside or outside, accessing of members, constructors, types of constructors, destructors and Pointer to class object.

Unit-3 **8L**

Polymorphism: function overloading, methods of overloading, constructor overloading, Operator overloading.
General overview of inheritance: Introduction, Categories of inheritance, public/protected/private inheritance, constructors and destructors in derived classes, and Virtual Base class.

Unit-4 **8L**

Function overriding and virtual functions, Abstract class and abstract base class, Friend functions, Templates in C++, function templates, class templates, templates and inheritances, templates and static members.

Unit-5 **8L**

File handing in C++: opening of file, closing of file, text files, binary files, Reading and writing into a file. Exception Handling in C++, including usage, try, throw and catch.

Text Books:

1. Kip R. Irvine, C++ and Object-Oriented Programming, Prentice Hall, 1997
2. R. Lafore, "Object Oriented Programming using C++", BPB Publications, 2004
3. E Balagurusamy "Object Oriented Programming with C++" T.M.H 2nd edition

Reference Books:

1. Schildt Herbert, "C++ Programming", 2nd Edition, Wiley DreamTech.
2. YashwantKanethkar, "Object Oriented Programming using C++",BPB, 2004

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Course Structure for B.Tech. (Civil Engineering)
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List of Programs in 'C++' Lab

Lab 1	(a) WAP to print first 10 prime numbers. (b) WAP to demonstrate nested loops. (c) WAP to print reverse of a given number. (d) WAP to read two numbers from keyboard and display the larger one.
Lab 2	(a) Create a class called Employee that includes three pieces of information as instance Variables – a first name (type String), a last name (type String) and a monthly salary (Double) (b) Create a constructor in above class to initialize the three instance variables. Provide a get method for each instance variable. (c) WAP to demonstrate destructors.
Lab 3	(a) Program to implement different types of inheritances like Multiple, Multilevel and hybrid. (b) Write a program in C++ demonstrating the public, protected and private parameters. (c) Write a program in C++ to demonstrate destructor in inheritance. (d) WAP to demonstrate encapsulation property of OOPs.
Lab 4	(a) Write a program that uses a class where the member functions are defined inside a class. (b) WAP that uses a class where member functions are defined outside a class. (c) WAP that uses a class where member functions are defined inside a class. (d) WAP to demonstrate the use of Static Data members.
Lab 5	(a) WAP to demonstrate the use of Dynamic Constructor. (b) WAP to demonstrate the use of function Template. (c) Illustrate and implement the C++ program to initiate the base constructor from derived class constructor.
Lab 6	(a) Write a C++ program to find the largest and smallest element of an array.
	(b) Create a class Matrix. Implement all possible matrix operations for Matrix type objects by overloading them.
Lab 7	(a) Create 2 classes OM and DB which store the value of distance. DM store distances in meters and cm and DB in feet and inches. Write a program that can read values for the class objects and add 1 object OM with another object of DB.
	(b) Define a class to represent bank account. Include the following members: **Data members** 1. Name of depositor. 2. Account number. 3. Type of account. 4. Balance amount in the account. **Member functions** 1. To assign initial values. 2. To deposit an amount. 3. To withdraw an amount after checking the balance. 4. To display name and balance. Write a main program to test the program.
Lab 8	(a) WAP to demonstrate static class data. (b) WAP to demonstrate the use of Public, Private and protected classes.
Lab 9	(a) WAP to illustrate the concept of call by reference. (b) WAP to illustrate the concept of unary operator overloading. (c) WAP to illustrate the concept of binary operator overloading.
Lab 10	(a) WAP to demonstrate the use of function overloading. (b) WAP using multiple inheritance for collecting employee details.
Lab 11	(a) WAP using function template to find maximum of two Data. (b) WAP to calculate factorial of given number using copy constructor.
Lab 12	(a) WAP to sort five float and integer numbers using template function (use bubble sort). (b) Demonstrate the use of different types of polymorphism.
Lab 13	(a) Write a function to read a matrix of size M × N from keyboard. (b) WAP to implement aggregation concept.

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Course Title: **Environmental Science**	Course Code: **BA1010**
Credit: **2**	L **2** T **0** P **0**
Year: **1st**	Semester: **I / II**

Unit – 1 **(6L)**

Natural Resources: Renewable and non-renewable resources

Definition, scope, importance and need for public awareness, natural resources and associated problems.

- Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
- Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
- Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture and green revolution, water logging, salinity.
- Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources.
- Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Unit – 2 **(5L)**

Ecosystems

Concept, Structure and function of an ecosystem, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the Forest and aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit – 3 **(5L)**

Biodiversity and its conservation

Introduction – Definition: genetic, species and ecosystem diversity. Bio geographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-sports of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit – 4 **(6L)**

Environmental Pollution

Definition, Cause, effects and control measures of:-

a. Air pollution b. Water pollution c. Soil pollution
d. Marine pollution e. Noise pollution f. Thermal pollution
g. Nuclear hazards

• Solid waste Management and biomedical waste: Causes, effects and control
• Role of an individual in prevention of pollution.
• Pollution effects-global warming, acid rain, ozone depletion, smog and case studies.
• Disaster management: floods, earthquake, cyclone and landslides.

Unit – 5 **(6L)**

Social Issues and the Environment

- From Unsustainable to Sustainable development
- Water conservation, rain water harvesting, watershed management
- Environmental Impact Assessment and Resettlement and rehabilitation problems.
- Climate change
- Wetland conservation.
- Role of remote sensing and GIS in environmental monitoring and analysis
- Environment Protection Act. 1986
- Air (Prevention and Control of Pollution) Act. 1981
- Water (Prevention and control of Pollution) Act 1974
- Wildlife Protection Act 1972
- Forest Conservation Act 1980.

Field work:

- Visit to a local area to document environmental assets river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

REFERENCE BOOKS:

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad –380 013, India, Email:mapin@icenet.net (R)
2. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
3. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
4. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
5. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
6. Gleick, H.P. 1993. Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
7. Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
8. Mckinney, M.L. & School, R.M. 1996. Environmental Science Systems & Solutions, Web enhanced edition. 639p.
9. AnubhaKaushik&Kaushik, C.P. 2009.Perspectives in Environmental Studies, New Age International Publishers.
10. Manahan. S.E., Environmental chemistry, 9th edition.

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Course Title: **Engineering Graphics**	Course Code: **LA1220**
Credit: 2	L **1** T **0** P **2**
Year: **1st**	Semester: **I / II**

UNIT – 1
Introduction: Sheet Layout, Types of Sheet, Size of Sheets, Title blocks, Type of lines, Lettering, Dimensioning, Scale (Full, Reduced, Large) Geometrical Constructions,
UNIT – 2
Projection: Methods of Projection, Planes of Projection, Projection of points, Projection of straight lines, Projection of auxiliary planes, Projection of planes.
UNIT – 3
Projection of solids, Sections of solids.
UNIT – 4
Development of surfaces
UNIT – 5
Isometric Projections

Reference Books:
1) Bhatt N. D. & Panchal V. M, "Engineering Drawing", Charotar Publisher, 2007.
2) Dhanjay A Jolhe, "Engineering Drawing" Tata McGraw Hill, 2008.
3) Gill P.S "Engineering Graphics" S. K. Kataria & Sons, 2009
4) John K.C, "Engineering Graphics" , 2nd edition, PHI Learning Pvt. Ltd., 2010

List of Experiments

1. Introduction to AutoCAD Commands, Explaining need of AUTO CAD over Manual drafting, Simple Drawings.
2. Sheet on Lettering and Geometric construction.
3. Orthographic Projections, Basic problem based on Projection of points.
4. Sheet on Projection of Lines.
5. Sheet on Projection of Planes.
6. Sheet on Projection of Auxiliary Planes.
7. Sheet on Projection of Solids.
8. Development of Surfaces.
9. Sheet on Isometric Projections from orthogonal views.

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Course Title: **Fluid Mechanics**	Course Code: **CA3210**
Credit: 4.5	L **3** T **1** P **2**
Year: **2nd**	Semester: **III**

UNIT-I

Fluid Properties and Hydrostatics: Introduction to Fluid Mechanics, Definition of Fluid, Solid and Fluid Continuum. Definition, Units and dimensions of Mass density, Specific weight, Specific Volume, Relative density, Viscosity, Capillarity & Surface Tension. Newton's law of viscosity, Equation for capillarity, Definition of Pressure, Hydrostatic pressure equation, Absolute and Gauge pressures. Measurement of Pressure; Simple and Differential Manometer, Problems,. Force exerted by a liquid on an inclined flat surface, Buoyancy.

UNIT-II

Kinematics and Dynamics of Fluid Flow: Introduction, Classification of flow, Three dimensional continuity equation (Cartesian coordinates), General Continuity equation, Stream function, Velocity potential, Stream line, Equipotential line, (Two dimensional only). Concept of inertia force and forces causing motion. Derivation of Euler's equation & Bernoulli's equation with assumptions and limitations, problems on application of Bernoulli's equation.

UNIT-III

Flow through Pipes: Introduction, Reynolds's number and its significance, Laminar and Turbulent Flow, Major and minor losses in pipe flow. Equation for head loss due to friction (Darcy's), Equation for head loss due to sudden expansion. Pipes in series, pipes in parallel and equivalent pipes, Water Hammer in pipes, Equations for pressure rise due to gradual and sudden closure of valves.

UNIT-IV

Dimensional Analysis and Model Studies: Introduction to Dimensional analysis, Units and dimensions, Dimensional Homogeneity. Raleigh's and Buckingham's methods of analysis, Model studies, similitude, dimensional parameters, Types of models, Froude's models: Reynold's models.

UNIT-V

Flow Measurements: Introduction, Equation for discharge over triangular notch, Rectangular notch, Trapezoidal notch and Broad Crested Weir, Equations for discharge through horizontal and inclined venturimeter, Problems. Measurement of velocity using pitot tube and pitot static tube, Classification of orifices, Hydraulic coefficients of an orifice, Problems on Vertical Orifice.

List of Experiments

1. Verification of Bernoullis Theorem
2. Metacentric Height
3. Calibration of V- Notch
4. Calibration of Rectangular Notch
5. Calibration of Trapezoidal Notch
6. Calibration of Venturimeter
7. Calibration of Orificemeter
8. Losses in Pipes

Text Books:

1. Bansal, R. K., "Fluid Mechanics and Hydraulic Machine", Lakshmi Publications, New Delhi.
2. Subramanya. K., "Fluid Fluid Mechanies", Tata McGraw Hill, New Delhi.
3. Rajput, R.K., **"**A Textbook of Fluid Mechanics and Hydraulic Machines", S. Chand Publications, 4th Edition.

Reference Books:

1. Modi, P. N., Seth, S.M., "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 2004.
2. Jain, A.K., "Fluid Mechanics: Including Hydraulic Machines", Khanna Publishers, New Delhi, 2010.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Building Material & Construction**	Course Code: **CA3220**
Credit: 4.5	L **3** T **1** P **2**
Year: **2nd**	Semester: **III**

UNIT-I

Introduction to Building Materials: Types of building stones, uses, deterioration and preservation, dressing stones classification, tests on bricks, types of tiles and their uses varieties of timber, defects in timber, tests for good timber, seasoning of timber, plywood, wooden boards, veneers.

UNIT-II

Lime, Concrete and other Building Materials: Types of limes and their Uses, chemical composition of Portland cement, types of cements and their uses, lime and cement mortar Ingredients, importance of mix proportioning, desirable properties of ingredients Cement Concrete, ingredients, mix proportions, uses, Reinforcing steel, structural steel, cast iron ,plain carbon steel, glasses, electrical-thermal & sound insulating materials, plastics & rubber .

UNIT-III

Foundations and Masonry: Bearing capacity of soil, classification of foundations, different types of foundations, definition of terms, bonds in brickwork rubble and ashlars masonry, masonry arch.

UNIT-IV

Flooring and Roofing, Stairs Doors and Windows: Different types of floors RCC and Tiled roofs, wooden and steel trusses types of stairs, requirements of stairs, types of doors, types of windows, ventilators.

UNIT-V

Plastering and Painting: Purposes and methods of plastering, Purpose of painting, method of painting on old and new surfaces. Lintels, Chajja, Balcony Formwork scaffolding shoring underpinning Cost effective construction: pre fabrication techniques, pre-cast building elements, hollow concrete blocks, stabilized mud blocks.

List of Experiments

A. Tests on Cement

1. Normal Consistency of cement.
2. Initial & final setting time of cement
3. Compressive strength of cement
4. Soundness of cement.
5. Tensile strength

B. Tests on Fine Aggregate

1. Sieve analysis of sand
2. Specific Gravity of fine Aggregate
3. Bulking of sand

C. Tests on Bricks

1. Water absorption.
2. Dimension Tolerances
3. Compressive strength

Text Books:

1. Kumar, S., "Building Construction", Standard Publishers Distributors, New Delhi, 16th Edition, 2006.
2. Rangwala, S. C., "Engineering Materials (Material Science)", Charotar Publishing House Pvt. Limited, 2008.

References:

1. Rai, M., Jaisingh, M. P., "Advanced Building Materials and Construction" CBRI Publications, Roorkee, 1985.
2. Punmia, B. C., "Building Construction", Lakshmi Publications (P) Ltd., New Delhi, 2005.
3. Rajput, R. K., "Engineering Material", S. Chand Publication, 2008.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Basic Surveying**	Course Code: **CA3230**
Credit: 4.5	L **3** T **1** P **2**
Year: **2nd**	Semester: **III**

UNIT-I

Introduction: Importance of surveying to engineers. Types and classification of survey. Concept of scale, Symbols & colours, Principles of surveying. Concept of field and office work. Horizontal and vertical control. Units of measurement. Definition of maps and understanding topographical maps of Survey of India.

UNIT-II

Horizontal Control: Operation and use of metric chain and tape. Sources of errors and corrections. Use of ranging rods, cross staff, arrows, pegs etc. Use of prismatic compass and - Surveyor's compass - Bearings - Whole circle and Reduced Bearing -Traversing - Local attraction - Magnetic dip and declination. Plane table survey and accessories- Radiation, intersection and traversing.

UNIT-III

Vertical Control: Definitions of terms used in levelling, different types of levels, adjustments, bench marks. Booking and reducing the levels- rise and fall method and plane of collimation method. Profile levelling- longitudinal and cross sectioning – Plotting. Contouring- definition and characteristics of contours. Uses of contours. Methods of contouring-direct and indirect.

UNIT-IV

Theodolite Survey: Definition – types, principle and fundamental axes. Temporary adjustments. Measurements of horizontal and vertical angles. Method of repetition and Reiteration. Finding out height and elevation of object by single and double plane method. Curves: Simple curve-Elements of simple curves. Designation of a curve. Setting out simple curve Tabulation and setting out of compound curve, reverse curve, transition curve, combined curve and vertical curves.

UNIT-V

Areas and Volumes: General methods for determining areas. Areas from offsets to a base line, area by double meridian distances, coordinates, map measurements and planimeter. Measurement of volume by prismoidal and trapezoidal formula, volume from spot levels and volume from contour plans.

List of Experiments

1. Study of different types of maps, their scales, latitude, longitude, colours and symbols.
2. Setting out polygons using prismatic compass& Location of details using compass traversing.
3. Method of radiation and intersection by plane tabling.
4. Two point and three point problem.
5. Finding elevations using dumpy level with change point and using plane of collimation method.
6. Plotting of contours by block levelling.
7. Finding horizontal angle by method of repetition, method of reiteration and measurement of vertical angles.
8. Finding out height and elevation of an object by single plane method.
9. Longitudinal and cross sectioning and plotting using AutoCAD.
10. Setting out simple curves by offsets from long chord & chord produced method.
11. Setting out simple curves by Rankine's deflection angle method.

Text Book:

1. Punmia, B. C., Jain, A. K., "Surveying", Laxmi Publications Pvt. Ltd., New Delhi, Vol. I, 16th Edition, 2005.
2. Punmia, B. C., Jain, A. K., "Surveying", Laxmi Publications Pvt. Ltd., New Delhi, Vol. II, 15th Edition, 2005.
3. Roy, S. K., "Fundamentals of surveying", Prentice Hall of India, New Delhi, 2nd Edition, 2010.
4. Basak, N. N., "Surveying and Levelling", Tata McGraw-Hill Publishing Company Ltd., 2008.

Reference Books:

1. Chandra, A. M., "Plane Surveying", New age International, 2nd Edition, 2006.
2. De, A., "Plane surveying", S. Chand and Company Ltd., 2000.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Solid Mechanics**	Course Code: **CA3010**
Credit: 3.5	L **3** T **1** P **0**
Year: **2nd**	Semester: **III**

UNIT-I

Simple Stresses and Strains: Introduction, Properties of Materials, Stress, Strain, Hooke's law, Poisson's Ratio, Stress – Strain diagram for structural steel and nonferrous metals, Principles of superposition, Total elongation of tapering bars of circular and rectangular cross sections. Elongation due to self – weight, Composite section, volumetric strains-expression, Elastic constants, relationship among elastic constants, Thermal stresses.

UNIT-II

Compound Stresses: Introduction, Stress components on inclined planes, General two dimensional stress system, Principal planes and stresses, Mohr's Circle of stresses. Thin cylinders subjected to pressure change in length, diameter and volume.

UNIT-III

Bending Moment and Shear Force in Beams: Introduction, Types of beams, loadings and supports, Shear force and Bending moment, Sign conventions, Relationship between loading, shear force and bending moment, Shear force and bending moment equations, SFD and BMD with salient values for cantilever beams, simply supported beams and overhanging beams for Point loads, UDL, Triangular loads and Couple.

UNIT-IV

Bending and Shear Stress in Beams: Introduction – Bending stress in beam, Assumptions in simple bending theory, Derivation of Bernoulli's equation for simple bending, Section modulus, Flexural rigidity, Expression for horizontal shear stress in beam, Shear stress distribution for rectangular, 'I' and 'T' sections. Combined Direct and Bending stresses Behaviour of Prismatic beams under Torsion.

UNIT-V

Deflection of Prismatic Beams & Elastic Stability of Columns: Definitions of slope, deflection, Elastic curve derivation of differential equation for flexure, Slope and deflection using Macaulay's method for simply supported, cantilever and overhanging beams subjected to point loads, UDL and Couple. Elastic stability of columns- Introduction – Short and long columns, Euler's theory on columns, Effective length slenderness ratio, radius of gyration, buckling load, Assumptions, derivations of Euler's Buckling load for different end conditions, Limitations of Euler's theory, Rankine's formula and problems.

Text Books:

1. Ramamrutham, S., Narayan, R., "Strength of Materials", DhanpatRai Publications, 14th Edition, 2011.
2. Rajput, R. K., "Strength of Materials", S. Chand Publications, 2006.

Reference Books:

1. Timoshenko, S. P., "Elements of Strength of Materials", East West Press, 2009.
2. Beer, F. P., Johnston, E. R., DeWolf, J. J. T., "Mechanics of Materials", The McGraw Hill Companies, 3rd Edition.
3. Basavarajaiah, B. S., Mahadevappa, P., "Strength of Materials", Orient Blackswan, New Delhi, 2010.
4. Pytel, A., Singer, F. L., "Strength of Materials", Harper Collins Publications, 1990.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Environmental Engineering-I**	Course Code: **CA3020**
Credit: 3.5	L **3** T **1** P **0**
Year: **2nd**	Semester: **III**

UNIT -I

Need for public water supply and role of engineers

Quantity of water, Different water demands, design period and population forecast-Arithmetic mean, Geometric mean and incremental increase method. Sources of water - Classification, adequacy and quality aspects.

UNIT -II

Quality of water

Physical, chemical and bacteriological analysis of water. Standards of Water quality desired for domestic water supplies – BIS and WHO Standards - Water borne diseases. Distribution of water- Different distribution systems, layouts and Reservoirs.

UNIT- III

Treatment of water

Objectives. Conventional treatment plant layout. Different treatment units (location and its function) - Screening, Aeration, Sedimentation, Filtration and Disinfection. Concept of flow though treatment units. Design of circular sedimentation tanks and Rapid Sand Filter. Miscellaneous treatment methods, Swimming pool water treatment.

UNIT -IV

Storage and distribution of water: Methods of distribution, pressure and gravity distribution systems, concept of service and balancing reservoirs, capacity of distribution reservoirs; general design guidelines for distribution system, Hardy - Cross method, Newton - Raphson method and equivalent pipe method of pipe network analysis; rural water supply distribution system

UNIT -V

Water supply to buildings

Street connection, internal storage (sumps and overhead tanks)-Capacity calculations.Supply systems within the building (overhead tanks and Hydro pneumatic systems).Pipe sizes and recommended velocities and pressures. Pipe fittings and pipe joints. Valves and taps.Hot water supply, Rainwater harvesting, Fire safety and fire fighting installation in buildings.

Text Books:

1. Garg, S. K., "Water Supply Engineering", Khanna Publishers (RS), New Delhi, 2010.
2. Punmia, B. C., Jain, A. K., "Environmental Engineering-I", Laxmi Publication (P) Ltd., New Delhi, 2005.

Reference Books:

1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi.
2. Panchdhari, A. C., "Water Supply and Sanitary Installations", New Age International Publishers, New Delhi, 2nd Edition, 2000.
3. Nazaroff, W. W., Cohen, A. L.,"Environmental Engineering Science", Wiley India, 2001.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Engineering Mathematics – III**			Course Code: **JA3010**
Credit: 3.5	L	T	P
	3	**1**	**0**
Year: **2nd**			Semester: **III**

UNIT – 1 **10L**

Functions of a complex variable:

Analytic functions, Canchy – Riemann equations, Harmonic functions, Line internal in the complex plane, Canchy's integral theorem, Canchy's integral formula for derivatives of analytic function.

UNIT – 2 **8L**

Power series, Taylor's series Laurent's series Residue, Poles, Zeros, singularities, Residue Theorem, Evaluation of real integrals of the type

$$\int_0^{2\pi} f(\cos\theta, Sin\theta)d\theta \;\&\; \int_{-\infty}^{\infty} f(x)dx$$

UNIT – 3 **8L**

Statistical Techniques.

Moments, Moment generating function, skewness, kurtosis, Curve fitting, Method of least square, Fitting of straight lines, Polynomials, Exponential curves etc., Correlation and Regression, Binomial, Poisson & Normal Distribution.

UNIT – 4 **8L**

Integral Transform.

Fourier integral, Fourier complex transform. Fourier sine and cosine transform, Hankel transform and its application.

UNIT – 5 **8L**

Series solution of ODE of 2nd order with variable coefficient with special emphasis to differential equation of Legendre and Bessel, Legendre Polynomial, Bessel functions and their properties.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Building Planning & Drawing**	Course Code: **CA3110**		
Credit: 1	L **0**	T **0**	P **2**
Year: **2nd**	Semester: **III**		

List of Experiments

1. Symbols used in Civil Engineering drawing, Masonry Bonds
2. To develop and draw detailed drawings like plan, elevation and sectional details of the residential buildings for the given line diagram,
3. Drawings of Doors & Windows.
4. Drawings of Stair Cases.
5. Drawings of Trusses.
6. Comprehensive Drawing of Residential building (Layout, plan, elevation & sectional elevation)
7. Preparation of lay out plan/Maps and building drawing using computer

Text Books:

1. Building Drawing; by Shah, Kale &P atki
2. Civil Engineering Drawing; by B.P. Verma

Reference Books:

1. National Building Code

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Hydraulics & Hydraulic Machines**	Course Code: **CA4210**
Credit: 4.5	L **3** T **1** P **2**
Year: **2nd**	Semester: **IV**

UNIT – I

Open Channel Flow: Definition of open channel, Geometric properties, Uniform flows in open channels: Chezy and Manning's equation, Most Economical sections: Rectangle, Trapezoidal and Circular Channels, Specific Energy, Specific energy curve, condition for minimum specific energy and maximum discharge, Critical flow in Rectangular channels, Problems. Gradually Varied Flow, Hydraulic Jump in a rectangular channels.

UNIT – II

Impact of Jet on Vanes: Introduction to impulse momentum equation and its applications, Force exerted by a jet on a fixed target, Derivations, Force exerted by a jet on a moving target, derivations, Force exerted by a jet on a series of a curved vanes, concept of velocity triangles, equation for work done and efficiency.

UNIT – III

Centrifugal and Reciprocating Pumps: Definition of pumps and classification, Principle of working, priming and methods, Specific speed, Work done and efficiencies of centrifugal and reciprocating pumps, Minimum starting speed, Cavitations in centrifugal pumps, multistage pumps.

UNIT – IV

Hydraulic Turbines: Introduction, types and classifications, Pelton wheel, equation for work done and efficiency, Specific speed, Kaplan turbine – Theory, equation for work done and efficiency, Design parameters. Francis Turbine

UNIT – V

Hydropower Plants: Introduction, types of Hydropower stations, Selection of Site for hydro power plant, definitions of general terms, layout of hydropower installations, components of hydropower plant, forebay and intake arrangements, head race or intake conduits, Surge tanks, draft tube and tail race, calculation of power potential, hydro power development in the country.

List of Experiments

1. To determine the Manning's Co-efficient of roughness for a given Channel bed
2. To study the characteristics of hydraulic jump
3. Experiments on Pelton Wheel Turbine
4. Experiments on Francis Turbine
5. Experiments on Centrifugal Pump
6. Experiments on Reciprocating Pump
7. Experiment on Impact of Jet

Text Books:

1. Bansal, R.K., "A Text Book of Fluid Mechanics and Hydraulic Machines", Firewall Media, New Delhi, 2005.
2. Rajput, R.K, "A Text Book of Fluid Machines & Hydraulic Machines" S. Chand & Co., New Delhi, Reprint 2006.

Reference Books:

1. Modi, P.N., Seth, S.M, "Hydraulics and Fluid Mechanics Including Hydraulics Machines", Standard Book House, New Delhi, 14th Edition, 2002.
2. Sahasrabudhe, S. R., "Irrigation Engineering and Hydraulic Structures", Katson publishing house, 10th Edition, 2012.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Advanced Surveying**	Course Code: **CA4220**
Credit: 4.5	L **3** T **1** P **2**
Year: **2nd**	Semester: **IV**

UNIT-I

Triangulation: Necessity of Control Surveying, Principle of Triangulation, Classification of Triangulation Systems, Station Marks, Towers and Signals, Satellite station, Intersected and Resected points, Reconnaissance, Inter-visibility of stations, Angular Measurement, Base line measurement and its extension.

UNIT-II

Project surveys: General requirements and specifications for engineering project surveys, reconnaissance, preliminary and locations surveys for highway, earthen bund and canals. Layout of culverts, canals, and buildings-both load bearing wall structure and column structures by centerline method. Modern trends- EDM, electronic Theodolites and Electronic Total Station

UNIT-III

Photogrammetry and remote sensing: Remote sensing: Definition and concepts. Concept of signatures. Multi-spectral concept. Remote sensing systems. Remote sensors and platforms. Data products generation and analysis. Application of remote sensing in agriculture, forestry, land cover/ use mapping, water resources, wet land management, coastal zone management and marine fisheries.

UNIT - IV

Global Positioning System: Global Positioning System- NAVSTAR GPS system. Advantages of GPS. Components of GPS- Space, control and user segments. Principles of position fixing with GPS. Relative and differential positioning. Factors affecting GPS observations, GPS applications.

UNIT-V

Geographic Information systems: Components of GIS-Hardware, software and expertise. Benefits and applications of IS. Geographic data- data input, processing –data structures- rafters and vectors, database management-layer concepts, spatial manipulation and analysis and graphical output and visualization.

List of Experiments

1. Marking of building by centre line method for load bearing wall residential building.
2. Marking of building by centre line method for columns for small commercial complex.
3. Exposure to the use of Total Station.
4. Measurement and data logging of distances, horizontal angles and vertical angles using Total Station.
5. Study of aerial photographs in 3D using stereoscope.
6. Use of satellite images for land use mapping.
7. Collection of field data using GPS.
8. Creation of data base (spatial & non spatial) using GIS Software.

Text Book:

1. Punmia, B.C., Jain, A.K., Jain, A.K., "Surveying", Laxmi Publications, N.Delhi, Vol.I & II, 12th Ed, 2005.
2. Reddi, M. A., "Remote Sensing and Geographical Information Systems", BS Publications, 2001.

Reference Books:

1. Roy S. K., "Fundamental of surveying", Prentice Hall of India, 2nd Edition, 2010.
2. Chandra, A. M., "Plane Surveying", New age International, 2nd Edition, 2006.
3. Arora, K.R., "Surveying", Standard Book House, Delhi, Vol. II & III, 11th Edition, 2010.
4. McCormac, J. C., Sarasua, W., Davis, W., "Surveying", Wiley India, 6th Edition, 2012.
5. Lillesand, T. M., Kiefer, R.W., Chipman, J. W., "Remote Sensing and Image Interpretation", John Wiley & Sons Limited, Canada, 5th Edition, 2004.
6. Agor, R., "A Text Book of Surveying and Levelling", Khanna Publications, Delhi, 11th Ed, Vol. II & III, 2012.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Concrete Technology**	Course Code: **CA4230**
Credit: 4.5	L **3** T **1** P **2**
Year: **2nd**	Semester: **IV**

UNIT -I

Concrete Ingredients and Microstructure

Cement – Chemical composition, hydration of cement, types of cement, manufacture of OPC with flow charts. Tests on cement – field testing, fineness, normal consistency, setting time, soundness, and compressive strength (detailed procedures covered in laboratory). Quality of mixing water.Fine aggregate – grading of aggregates, sieve analysis, specific gravity, bulking, moisture content, deleterious materials. Coarse aggregate – importance of size, shape and texture, grading of aggregates, sieve analysis, specific gravity, flakiness and elongation index, crushing, impact and abrasion tests (detailed procedures to be covered in laboratory), Structure of aggregate phase, structure of hydrated cement paste, structure - property relationship in hydrated cement paste, transition zone in concrete, influence of transition zone on properties of concrete.

UNIT -II

Fresh Concrete

Workability – definition, factors affecting workability, measurement of workability by slump, compaction factor, Vee-Bee, flow tests. Segregation and bleeding, process of manufacture of concrete – batching. Mixing, transporting, placing, compaction, curing of concrete.Chemical admixtures – plasticizers, accelerator, retarders and air entraining agents. Mineral admixtures – fly ash, blast furnace slag, metakaolin, Silica fume, rice husk ash.

UNIT -III

Hardened Concrete

Factors affecting strength, w/c ratio, gel/space ratio, maturity concept, effect of aggregate properties, compressive strength, tensile strength, bond strength, modulus of rupture, modulus of elasticity, Poisson's ratio, relationship between these parameters. Accelerated curing, aggregate- cement bond strength. Shrinkage – plastic shrinkage and drying shrinkage, factors affecting shrinkage. Creep – measurement of creep, factors affecting creep, effect of creep. Durability – definition, significance, permeability, sulphate attack, chloride attack, carbonation, freezing and thawing. Factors contributing to cracks in concrete – plastic shrinkage, settlement cracks, construction joints. Thermal expansion, transition zone, structural design deficiencies. Tests on hardened concrete – compressive strength, split tensile strength, flexural strength, non-destructive testing of concrete.

UNIT -IV

Concrete Mix design

Concept of mix design, variables in proportioning, exposure conditions, procedure of mix design as per IS 10262-1982, numerical examples of mix design.

UNIT -V

Special Concretes

Constituents, Properties and applications of lightweight concrete, high performance concrete (HSC, SCC), high density concrete, fibre reinforced concrete, Ferro-cement.

List of Experiments

I. Tests on Coarse Aggregate

1. Crushing value of aggregate
2. Impact value of aggregate
3. Water absorption of aggregate
4. Sieve Analysis of Aggregate
5. Specific gravity & bulk density
6. Grading of aggregates.

II. Tests on Fresh Concrete

1. Workability Tests – Slump Test & Compaction Factor Test
2. Flow Test

III. Tests on Hardened Concrete

1. Compressive Strength Test
2. Flexural Strength Test
3. Split Tensile Strength Test
4. Non Destructive Testing of Concrete

IV. Mix Design

1. Concrete mixed design as per Indian Standard recommendation guidelines.

Text Books:

1. Shetty, M. S., "Conerete Technology", S. Chand & Co. Ltd, New Delhi, 6th Edition, 2005.
2. Mehta, P. K, Monteiro, P. J. M., "Concrete: Microstructure, Properties, and Materials", McGraw Hill Professional, 2013.
3. Gambhir, M. L., "Concrete Technology", Tata McGraw Hill, New Delhi, 5th Edition, 2013.
4. Neville, A. M., Brooks, J. J., "Concrete Technology", Prentice Hall, 2nd Edition, 2010.

Reference Books:

1. Neville, A. M., "Properties of concrete", ELBS Publications, London.
2. IS: 10262: "Recommended Guidelines for Concretes Mix design", BIS Publication.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Engineering Geology**	Course Code: **CA4240**
Credit: 4.5	L **3** T **1** P **2**
Year: **2nd**	Semester: **IV**

UNIT-I

Physical Geology

Geology and its importance in civil engineering projects.Internal structure of the earth and its composition.Epigene and Hypogene geological agents: Weathering of rocks, Kinds of weathering, Formation of soil and its classification, Soil profile, Soil erosion and its conservation. Geological hazards such as landslides and earthquakes, causes, effects and remedial measures. Concept of plate tectonics and seafloor spreading.

UNIT-II

Applied Mineralogy

Definition of mineral, Physical and chemical properties in minerals, Classification of minerals based on chemistry such as rock forming Minerals, Economic ore minerals and industrial minerals. Study of Common Rock forming minerals: Silicate Structure, Quartz and its verities, Feldspars group, Mica Group, Amphibole Group, and Pyroxene Group, Olivine Group. Some other group of Chlorite, Oxide and Carbonates.

UNIT-III

Petrology

Igneous rocks: Mode of occurrence, Classification, Texture and Structure. Sedimentary rock: Mode of occurrence, textures and structures. Metamorphic rocks- Metamorphism, Agents of metamorphism, Types of metamorphism, Textures and Structure Common Igneous rocks of India: Granite, Granite Porphyry, Basalt, Diorite, Syenite, Dolerite, Gabbro. Common Sedimentary rocks of India: Sandstone, Limestone, Conglomerate and Shale. Quartzite, Common Metamorphic Rocks of India: Mica Schist, Marble, Gneisses and Slate.

UNIT-IV

Structural Geology

Definition, out crops, Dip and Strike, Compass clinometer.Description of folds, Faults, Joints and Unconformities with their Types.Recognition of folds and faults in the field, and its Consideration in Civil Engineering projects.

UNIT-V

Engineering and Ground water Geology

Engineering Geology: Geological site investigation surface and subsurface explorations by Geological and Geo-Physical investigations.Selection of Geological site for construction of Dams and Reservoirs, Tunnels, Bridge Sites, and Highways.Introduction to different Building Materials. Ground water Geology: Hydrological cycle, water bearing properties of rocks and soils. Aquifers and its types.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20
List of Experiments

1. **Identification of minerals in hand specimen:**
   i. Descriptive Study and identification of Rock forming Minerals in Hand Specimen: Quartz and its varieties, Feldspar and its varieties, Mica and its varieties, Alumino-silicate mineral and its varieties (Silicate Group), Calcite, Dolomite (Carbonate Group) etc.
   ii. Descriptive Study and identification of Economic Minerals in hand specimen: Hematite, Magnetite, Chromite, Bauxite, Pyrite, Chalcopyrite, Galena.
   iii. Descriptive Study and identification of Industrial Mineral: Asbestos, Corundum, Gypsum, Kaolin.
   iv. Descriptive Study and identification of Minerals in Thin Section (Microscope).

2. **Identification of minerals in hand specimen:**
   i. Descriptive Study and identification of different Rock group (Igneous, Sedimentary, and Metamorphic) in Hand Specimen.
3. **Study on Maps:**
   i. Study and Interpretation of Contour.
   ii. Topographic and Geological maps
   iii. Solving Dip and Strike problems
   iv. Borehole problems.

Text Book:

1. Singh, P., "Engineering Geology", S. K. Kataria & Sons, New Delhi, 2009.
2. Sathyana Swamy, B.S, "Engineering Geology", Dhanpat Rai & Co., New Delhi.

Reference Books:

1. Reddy D. V., "Engineering Geology', Vikas Publishing House Pvt. Ltd, Noida.
2. Varghese, P. C., "Engineering geology for Civil Engineers", PHI Learning Pvt. Ltd., 2012.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Structural Analysis - I**	Course Code: **CA4010**
Credit: 3.5	L **3** T **1** P **0**
Year: **2nd**	Semester: **IV**

UNIT – I

Introduction and Analysis of Plane Trusses

Structural forms, Conditions of equilibrium, Degree of freedom, Linear and Nonlinear analysis, Static and Kinematic indeterminacies of structural systems, Types of trusses, Assumptions in analysis, Analysis of determinate trusses by method of joints and method of sections.

UNIT – II

Deflection of Beams

Deflection of determinate beams by Moment area and Conjugate beam methods, Strain energy due to axial force, BM and SF, Principle of virtual work and Castigliano's theorems, Maxwell's Reciprocal Theorem and Betti's Theorem, Unit load and its application to deflection of determinate beams and trusses.

UNIT – III

Arches and Cable Structures

Three hinged and two hinged parabolic arches with supports at same and different levels, Determination of normal thrust, radial shear and bending moment, Analysis of cables under point loads and UDL, Length of cables for supports at same and at different levels, Stiffening Girders, Stiffening trusses for suspension cables

UNIT – IV

Influence Lines and Moving loads

Concept of influence lines, ILD for reactions, SF and BM for determinate beams, Muller Bresleau Principle, ILD for axial forces in determinate trusses, BM, SF and axial forces in determinate systems using ILD, Maximum BM and SF in determinate beams using rolling loads concepts, ILD for arches

UNIT – V

Analysis of Indeterminate Beams

Propped cantilevers and fixed beams using method of consistent deformations Forces due to rotation and settlement of supports.

Text Books:

1. Reddy, C. S., "Basic Structural Analysis", Tata McGraw Hill, New Delhi, 2011.
2. Jain, A. K., "Elementary Structural Analysis", Nem Chand Publishers, Roorkee, 1990.
3. Ramamrutham, S., Narayan, R., "Theory of Structure", DhanpatRai& Co. Ltd.

Reference Books:

1. Norris, C. H., Wilbur, J. B., "Elementary Structural Analysis", International Student Edition, Literary Licensing, LLC, 2012.
2. Negi, L. S., Jangid, R. S., "Theory and Problems in Structural Analysis", Tata McGraw Hill, New Delhi, 1st Edition, 1997.
3. Jain, O.P., Jain, B.K., "Theory & Analysis of Structures", Vol. I & II, Nem Chand.
4. Wang, C. K., "Intermediate Structural Analysis", McGraw-Hill, 1st Edition, 2010.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Hydrology**	Course Code: **CA4020**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **2nd**	Semester: **IV**

UNIT -I

Precipitation: Introduction, hydrologic cycle. Definition of Precipitation, forms and types of precipitation. Measurement of rainfall using Non recording (Simson) and Recording (Syphon) Rain Gauges .Computation of average rainfall over a Catchment area. Checking the consistency of rain fall data by double mass curve methods, computation of missing rainfall by different methods

UNIT –II

Runoff: Introduction, catchment area, component of runoff factor affecting runoff, rainfall – runoff relationship. Runoff hydrograph: components separation of base flow by different methods, ϕ-index and W-index, unit hydrograph theory , assumption, limitations and advantages, derivation of unit hydrograph from simple storm Hydrographs, S curve and its uses.

UNIT-III

Water Losses: Introduction, types of losses. infiltration - definition factor affecting infiltration indices, measurement of infiltration, Evaporation- definition, factor affecting evaporation, methods of measurement, methods of reducing evaporation. Potential evaporation measurement estimation of consumptive use under Indian conditions.

UNIT –IV

Flood and Flood Routing: Introduction, Various methods of flood discharge-Rational method, Empirical method, Unit hydrograph method, Gumbel's method, Introduction to flood routing, Basic equations, Hydrologic storage routing, Attenuation, Hydrologic channel routing- Muskingum equation, Flood control.

UNIT-V

Ground Water hydrology: Basic concept of ground water , definition, occurrence and distribution, safe yield and specific yield of aquifers, flow of water in saturated and unsaturated soils , Darcy laws – transmissibility of aquifers Problems an confined and unconfined aquifer.

Text books:

1. Reddy, P. J. R., "A Text Book of Hydrology", Lakshmi publication, New Delhi, 2005.
2. Patra, K. C., "Hydrology and Water Resources Engineering", Alpha Science International, 2nd Edition, 2008.
3. Subramanya, K., **"**Engineering Hydrology**",** Tata Mcgraw Hill, New Delhi, 4th Edition, 2013.

References books:

1. Sharma, R.K., Sharma, T. "A Textbook of Hydrology and Water Resources Engineering", Dhanpat Rai, New Delhi, 1987.
2. Raghunath, H. M., **"**Hydrology**",** New Age international (P) Ltd., New Delhi, 2nd Edition, 2006.

Course Title: **Industrial Tour**	Course Code: **CA4410**
Credit: 1	L: **0** T: **0** P: **2**
Year: **2nd**	Semester: **IV**

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Transportation Engineering – I**	Course Code: **CA5210**
Credit: 4.5	L **3** T **1** P **2**
Year: **3rd**	Semester: **V**

UNIT-I

Highway Development and Planning: Importance of transportation, Different modes of transportation and their characteristics, Classification of roads, Different road patterns, Jaykar committee recommendations and implementation, Twenty year road development plans in India, Introduction to recent developments in road network in India, Highway planning and alignment,

UNIT-II

Geometric Design: Highway Cross sectional elements, Sight distances, Super elevation, Camber, Extra widening on curves, Design of horizontal and vertical alignments.

UNIT-III

Highway Materials and Properties: Classification of subgrade soil, CBR and plate load tests on soil, Properties and requirements of road aggregates and bitumen, Cutbacks and bituminous emulsions, Introduction to new materials in pavements.

UNIT-IV

Pavement Design and Maintenance: Various factors of pavement design, Concept of ESWL, Design of flexible pavement by IRC method, Stresses in rigid pavement, Design of rigid pavement thickness by IRC method.Various types of failures, Pavement Evaluation, remedial measures and maintenance practices.

UNIT-V

Traffic Engineering: Introduction to Traffic Engineering, Traffic Characteristics, Road user and vehicular characteristics, Traffic Studies, Traffic operations, Traffic control devices.

List of Experiments

A. Test of Bitumen
1 Specific gravity test of bitumen
2 Ductility test of bitumen
3 Flash point and fire point test of bitumen
4 Penetration test of bitumen
5 Softening test of bitumen
6 Viscosity test of bitumen
7 Bitumen Content
8 Stripping Test on aggregate

B. Test of Aggregate
1 Abrasion test of aggregate
2 Shape test (flakiness, elongation and angularity number) of aggregate
3 Impact value test of aggregate
4 Specific gravity test of aggregate
5 Crushing strength of aggregate

C. Test of Tar
1 Viscosity of tar

D. Test of Bituminous Mix
1 Marshall Test for stability and flow value

E. Field Tests
1 Benkelman Beam Test (Demonstration)

Text Books:

1. Khanna, S. K., Justo, C. E. J., Veeraraghavan, A., 'Highway Engineering", Nem Chand and Bros., Roorkee, 9th Edition, 2011.
2. Kadiyali, L. R., Lal, N. B., 'Principles and Practices of Highway Engineering", Khanna Publishers, New Delhi, 4th Edition, 2005.
3. Kadiyali, L. R., "Traffic Engineering and Transportation Planning", Khanna Publishers, New Delhi, 6th Edition, 1997.

Reference Books:

1. Sharma, S. K., Sharma, R. C., "Principles and Design of Highway Engineering", S. Chand & Company.
2. Khanna, S. K., Justo, C. E. J., "Highway Material Testing Laboratory Manual", Nem Chand and Bros., Roorkee.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Environmental Engineering – II**	Course Code: **CA5220**
Credit: 4.5	L **3** T **1** P **2**
Year: **3rd**	Semester: **V**

UNIT-I

Introduction: Introduction, Basic Definitions, Need for waste water collection, Conveyance, Treatment and disposal, Types of sewerage systems, Quantity of sewage, Dry weather flow and factors affecting dry weather flow, Flow variations and their effects on design of sewerage system, Computation of design flow, Estimation of storm flow by Rational method, Time of concentration and return period.

UNIT-II

Design of Sewers: Hydraulic formulae for velocity, Effects of flow variation on velocity, Self-cleansing and Non scoring velocities, Hydraulic design of circular sewers, Types of sewer materials (Concrete, PVC, CI and stoneware) used, Advantages and disadvantages of materials, Suitability of sewer material for different locations, Laying and jointing of sewers, Testing of sewers, Ventilation and cleaning of sewers, Street inlets, Catch basins, Manhole and drop manhole.

UNIT-III

Wastewater Characterization: Analysis of sewage, Physical, chemical and biological characteristics with emphasis on BOD and COD, Concept of aerobic and anaerobic activity, Sampling, Effluent standards.

UNIT-IV

Treatment of Sewage: Flow diagram of municipal sewage treatment plant, Primary treatment, Screening, Grit chamber, Skimming tank, Primary sedimentation tank, Design approaches.

UNIT-V

Secondary Treatment: Theory and operation of trickling filter and types of trickling filters, Design of single stage trickling filter, Activated sludge process and its modifications, Design aspects of activated sludge process, Sludge digestion, Sludge drying beds, Other methods of sludge disposal on site treatment method.

List of Experiments

1. Determination of turbidity, color and conductivity
2. Determination of pH, alkalinity and acidity
3. Determination of hardness and chlorides
4. Determination of residual chlorine and chlorine demand
5. Determination of dissolved oxygen
6. Measurement of air pollutants with high volume sampler
7. Measurement of sound level with sound level meter

Text Book:

1. Garg, S. K., "Environmental Engineering: Sewage Disposal and Air Pollution Engineering", Khanna Publishers, New Delhi, 26th Edition (Paperback), Vol. II, 2010.
2. Punamia, B. C., Jain, A. K., "Waste Water Engineering", Firewall Media, New Delhi, 1998.

Reference Books:

1. Manual on Sewage and Sewerage Treatment, CPHEEO, Ministry of Urban Development, New Delhi.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Soil Mechanics**	Course Code: **CA5230**
Credit: 4.5	L **3** T **1** P **2**
Year: **3rd**	Semester: **V**

UNIT -I

Introduction: Definition of void ratio, Porosity, percentage air voids, Air Content, Degree of saturation, moisture content, specific Gravity, Bulk density. Dry density, saturated density, Submerged density and their inter relationships.

Properties of Soils: Index property of soil –particle size Distribution, Relative Density, consistency limits and indices, in situ density, laboratory method of determination of index properties of soil: moisture content, specific gravity, particle size distribution (Sieve analysis and hydrometer analysis only), in situ density by Core cutter &sand replacement methods, relative density, liquid limit-Casagrande and Cone penetration method, Plastic limit and Shrinkage limit determination.

UNIT –II

Classification of soils: purpose of soil classification, basis of soil classification, particle size classification-MIT classification and IS classification, plasticity chart and its importance, field identification of soil.

Clay mineralogy and Soil Structure: single grained, honey combed, flocculent and dispersed structure, Electric diffuse a double layer, Adsorb water, Base Exchange capacity, Isomorphous substitution. Common Clay mineral in soil and their structure- Kaolonite, Illite and montmorillonite.Thixotropy of clay, Soil water system, Effective stress concept total pressure and effective stress, quick sand phenomenon, capillary phenomenon.

UNIT-III

Flow of Water Through Soils: Darcy's law- assumptions and validity, coefficient of permeability and its determination (laboratory and field) factor affecting permeability, permeability of stratified soil, seepage velocity, superficial velocity and coefficient of percolation.

Compaction of Soils: Principle of compaction, standard and modified proctor's tests, factor affecting compaction, effect of compaction on soil properties, field compaction control, proctor needle, compacting equipments.

UNIT-IV

Consolidation of Soils: Definition, Mass spring Analogy, Terzaghi's one dimensional consolidation theory assumption and limitation, normally consolidated, under consolidated and over consolidated soils pre consolidation pressure and its determination by Casagrande's method. Consolidation characteristics of soil, laboratory one dimensional consolidation test, Determination of consolidation characteristic Proportioning of soil compression index and coefficient of consolidation, determination of coefficient of consolidation by square root of time fitting method, logarithmic time fitting method.

UNIT –V

Shear Strength of Soils: Concept of shear strength, Mohr-coulomb theory, conventional and modified failure envelope, total and effective shear strength parameters, concept of pore Pressure, factor affecting shear strength of soils, sensitivity, Measurement of shear strength- direct shear test, Unconfined compression test, Triaxial compression test and Vane shear test, shear tests and under different drainage condition.

List of Experiments

1. Sieve Analysis
2. Hydrometer Analysis
3. Liquid, Plastic& Shrinkage Limit Test
4. Proctor Compaction Test
5. Triaxial Compression Test
6. Specific Gravity Determination of Coarse and Fine Grained Soils
7. In Situ Density-Core Cutter & Sand Replacement Test
8. Permeability Test
9. Direct Shear Test
10. California Bearing Ratio Test
11. Static Cone Penetration Test
12. Standard/Dynamic Cone Penetration Test

Text books:

1. Punmia, B. C., Jain, A. K., Jain, A. K., "Soil Mechanics and Foundations", Laxmi publication Co. New Delhi, 16th edition, 2005.
2. Ranjan, G., Rao, A. S. R., "Basic and Applied Soil Mechanics", New Age International (P) Ltd., New Delhi, 2nd Edition, 2005.

References books:

1. Das, B. M., Sobhan, K., "Principles of Geotechnical Engineering" 8th Edition. Thomson business information India (P) Ltd., India
2 Singh, A., Chowdharyg, R.,"Soil Engineering in Theory and Practice", CBS publishers and distributors Ltd., New Delhi.
3. Murthy, V. N. S., "Soil Mechanics and Foundation engineering", 4th Edition, UBS publishers and Distributors, New Delhi.
4. Sitaram, T. G., Ramamuthy, T. N., "Geotechnical engineering", S. Chand & Co New Delhi.
5. Off., H. M. S., "Soil mechanics for road engineers, Road Research Laboratory", U. K., Vol. I, 1952.

Department of Civil Engineering
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Batch: 2016-20

Course Title: **Design of Reinforced Concrete Elements**	Course Code: **CA5010**
Credit: 3.5	L **3** T **1** P **0**
Year: **3rd**	Semester: **V**

UNIT -I

Introduction to Working Stress Design: Introduction to working stress method, elastic behavior of rectangular section, under, balanced and over reinforced section. Deflection and cracking in beams and slabs using IS code provisions. Design of singly reinforced beams

UNIT –II

Introduction to Limit State Design:-Philosophy and principle of limit state design along with the assumptions, partial safety factors, characteristic load and strength. Introduction to stress block parameters, concept of balanced, under reinforced and over reinforced sections, limit state of collapse in flexure of rectangle and flanged sections with examples. Limit state of collapse in shear and torsional strength of sections with examples

UNIT-III

Limit state design of beams:-Design principles and procedures for critical sections for bending moment and shear forces. Flexural and shear design example of singly and doubly reinforced simply supported and cantilever beams using the codal provision. Detailing of longitudinal and shear reinforcement, anchorage of bars, check for development length. Reinforcement requirements, slenderness limits for beams for lateral stability. Flexural and shear design of simply supported T and L beams. Design of rectangular section for torsion.

UNIT-IV

Limit State Design of Slabs : Introduction to one way and two way slabs, design of one way cantilever, simply supported and continuous slab and design of two way slabs.

UNIT –V

Limit State Design of Columns and Footings: General design aspects of compression members. Design of short axially loaded columns with reinforcement detailing.Design of uniaxial and biaxial bending columns using SP- 16 charts and design of slender column. Design and detailing of isolated rectangular footing for axial load and uniaxial moment and design of pedestal.

Text books:

1. Pillai, S. U., Menon, D., **"**Design of reinforced concrete structures"- Tata Mcgraw hill publications, 3rd Edition, 2009.
2. Verghese, P. C., "Limit State Design of Reinforced Concrete", PHI Learning Pvt. Ltd., India, 2nd Edition, 2008.

References Books:

1. Sinha, S. N., "Reinforced concrete Design", Tata McGraw-Hill Education, New Delhi, 2002 .
2. Park, R., Paulay, T., "Reinforced Concrete Structures", John Wiley and Sons, New York, 1975.
3. Punmia, B. C., Jain, A. K., Jain, A. K., "Limit State Design of Reinforced Concrete", Firewall Media, New Delhi, 2007.
4. Jain, A. K., "Reinforced Concrete Limit State Design", Nemchand & Brothers, Roorkee.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Structural Analysis – II**	Course Code: **CA5020**
Credit: 3.5	L **3** T **1** P **0**
Year: **3rd**	Semester: **V**

UNIT –I

Slope Deflection Method:

Introduction, Sign convention, Development of slope-deflection equation, Analysis of continuous beams, Analysis of orthogonal rigid plane including sway frames with kinematics indeterminacy.

UNIT –II

Moment Distribution Method:

Introduction, Definition of terms, Development of method, Analysis of continuous beams, Analysis of orthogonal rigid plane including sway frames with kinematics indeterminacy.

UNIT-III

Matrix Method of Analysis (Flexibility Method):

Introduction, Axes and coordinates, Flexibility matrix, Analysis of continuous beams and plane trusses using system approach. Analysis of orthogonal rigid frames using system approach.

UNIT-IV

Matrix Method of Analysis (Stiffness Method):

Introduction, Stiffness matrix, Analysis of continuous beams and plane trusses using system approach, Analysis of orthogonal rigid frames using system approach.

UNIT-V

Plastic Method of Analysis:

Introduction and basic concept of plastic analysis, Shape factors of simple sections, Equilibrium and mechanism methods, Collapse loads for simple and continuous beams

Text books:

1. Negi, L., Jehangir, R., "Structural Analysis", Tata McGraw Hill Publication Co. Ltd., 1st Edition, 2004.
2. Gupta, R., Pandit, G. S., Gupta, S. P., "Theory of Structures", Tata McGraw Hill Publication Company Ltd., 1st Edition, Vol. II, 2013.
3. Wang, C. K., "Intermediate Structural Analysis", McGraw-Hill, New Delhi, 1983.

Reference Books:

1. Sterling, J., Kinney, "Intermediate Structural Analysis "Oxford of IBH Publishing Company.
2. Norris, C. H., Wilbur, J. B., "Elementary Structural Analysis," McGraw Hill International Book Edition, 4th Sub- Edition, 1990.
3. Jain, A. K., "Advanced Structural Analysis", Nem Chand Bros, Roorkee, India.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Engineering Economics**	Course Code: **GC5010**
Credit: 2	L: **2** T: **0** P: **0**
Year: **3rd**	Semester: **V**

UNIT-I
Time value of money: Simple and compound interest, Time value equivalence, Compound interest factors, Cash flow diagrams, Calculation, Calculation of time –value equivalences. Present worth comparisons, Comparisons of assets with equal, unequal and infinite lives, comparison of deferred investments, Future worth comparison, payback period comparison.

UNIT-II
Use and situations for equivalent annual worth comparison, Comparison of assets of equal and unequal life. Rate of return, Internal rate of return, comparison of IIR with other methods, IRR misconceptions.

UNIT-III
Analysis of public Projects: Benefit/ Cost analysis, quantification of project, cost and benefits, benefit/ cost applications, Cost –effectiveness analysis.

UNIT-IV
Depreciation, computing depreciation charges, after tax economic comparison, Break-even analysis; linear and non-linear models. Product and Process Costing, Standard Costing, cost estimation, Relevant Cost for decision making, Cost control and Cost reduction techniques.

Course Title: **Aptitude Building - I**	Course Code: **CA5310**
Credit: 1	L: **0** T: **0** P: **2**
Year: **3rd**	Semester: **V**

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Course Title: **Design of Reinforced Concrete Structures**	Course Code: **CA6010**
Credit: 3.5	L **3** T **1** P **0**
Year: **3rd**	Semester: **VI**

UNIT-I

Design of Stair Cases:
General specifications, Types of stair cases, Loads on stair cases, Effective span of stairs, Design of dog legged stair case, Design of open well stair case

UNIT-II

Retaining Walls:
General specifications, Forces acting on retaining walls, Stability consideration, Wall proportioning, Design of cantilever type retaining walls, Design of counterfort type retaining walls.

UNIT-III

Water Tanks
Types of water tanks, Design of circular water tanks resting on ground with rigid base, Design of circular water tanks resting on ground with flexible base, Design of overhead water tank (Intz type tank).

UNIT-IV

Design of Continuous Beams
Introduction to continuous beams, Design of continuous RC beams, Moment redistribution

UNIT-V

Multi-storey Building Frames
Introduction to multi-storey building frames, Analysis of multi-storey frames, Method of substitute frames

Text Book:

1. Pillai, S. U., Mennon, D., "Reinforced Concrete Design", Tata McGraw Hill Publications, New Delhi, 2nd Edition, 2003.
2. Raju, N. K., "Advanced Reinforced Concrete Design", CBS Publishers, New Delhi, 2nd Edition, 2013.

Reference Books:

1. Sinha, S. N., "Reinforced Concrete Design", Tata McGraw Hill Publications, New Delhi, 2nd Edition, 2007.
2. IS 456: 2000, "Plain and Reinforced Concrete - Code of Practice", 4th Revision, BIS, New Delhi.
3. SP 16: "Design Aid for RC to IS: 456-1978", BIS, New Delhi.
4. SP 34: "Handbook on Concrete Reinforcement and Detailing", BIS, New Delhi.

Department of Civil Engineering
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Course Title: **Design of Steel Elements**	Course Code: **CA6020**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **3rd**	Semester: **VI**

UNIT-I

Introduction & Connections:
Introduction, Types & properties of structural steel rolled sections, Grades of steel, Codal Provisions, Concept in the design of connections, Codal Provisions, Simple and moment resistant riveted, welded and bolted connections.

UNIT-II

Tension Members:
Introduction, Codal provisions, Analysis and design of tension members with different cross sections subjected to axial tension, Lug angle

UNIT-III

Compression Members:
Codal provisions, Slenderness ratio, Analysis and design of simple compression members (angles and I-Sections), Built up compression members, Lacing and battening.

UNIT-IV

Flexural Members:
Concept in the design of flexural member, Codal provisions, Analysis and design of laterally restrained and unrestrained beams, Built up beams, Web buckling and web crippling.

UNIT-V

Plate Girder:
Design of plate girders including stiffeners, splices and curtailment of flange plates.

Text Book:

1. Subramanian, N., "Design of Steel structures: Theory and Practice", Oxford University Press, New Delhi, 3rd Edition, 2011.
2. Duggal, S. K., "Design of Steel structure", Tata McGraw Hill, New Delhi, 3rd Edition, 2009.
3. Negi, L. S., "Design of Steel structures", Tata McGraw Hill, New Delhi, 2nd Edition, 1997.

Reference Books:

1. Gaylord, E. H., Gaylord, C. N., Stallmeyer, J. E., "Design of Steel structures", Tata McGraw Hill, New Delhi, 3rd Edition, 1991.
2. IS 800: 2007, "General Construction In Steel- Code of Practice", BIS, New Delhi.
3. SP 6: (Part-1, 2, 3, 4, 5, 6 and 7), "Structural Engineering Hand Book", BIS, New Delhi.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Foundation Engineering**	Course Code: **CA6030**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **3rd**	Semester: **VI**

UNIT-I

Introduction & Soil Exploration:

Role of civil engineers in the selection, design and construction of foundation of civil engineering structures, Brief review of soil mechanics principles used in foundation engineering, Methods of soil exploration, Boring, Sampling, Penetration tests, Correlations between penetration resistance and soil design parameters

UNIT-II

Earth Pressures and Retaining Walls:

Earth pressure at rest, Active and passive earth pressure, Rankine's and Coulomb's earth pressure theories, Earth pressure due to surcharge, Retaining walls, Stability analysis of retaining walls, Proportioning and design of retaining walls.

UNIT-III

Slopes:

Mode of failure- Mechanism, Stability analysis of infinite slopes, Swedish slip circle method, Taylor's stability number and stability curves, methods of slices, Bishop's simplified method.

UNIT-IV

Foundations:

Types of Foundations, Mechanism of load transfer in shallow and deep foundations, Shallow foundations, Terzaghi's bearing capacity theory, Computation of bearing capacity in soil, Effect of various factors, Use of field test data in design of shallow foundations, Stress below the foundations, Settlement of footings and rafts, proportioning of footings and rafts, Sheeting and bracing of foundation excavation

UNIT-V

Pile, Well and Machine Foundations:

Types and methods of construction, estimation of pile capacity, Capacity and settlement of group of piles, Proportioning of piles, Methods of construction of well foundation, Tilt and Shift, Remedial measures, Bearing capacity, Settlement and lateral stability of well foundation. Expansive and collapsible soil, Introduction to soil dynamics.Machine foundations

Text Books:

1. Punmia, B. C., Jain, A. K., Jain, A. K., "Soil Mechanics and Foundations", Laxmi publication Co. New Delhi, 16th edition, 2005.
2. Ranjan, G., Rao, A. S. R., "Basic and Applied Soil Mechanics", New Age International (P) Ltd., New Delhi, 2nd Edition, 2005.

Reference Books:

1. Bowles, J. E., "Foundation Analysis and Design", McGraw-Hill, New Delhi, International Edition, 2001.
2. Singh, A., Chowdhary, G. R., "Soil engineering in theory and practice", CBS Publishers, New Delhi.

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Course Title: **Transportation Engineering - II**	Course Code: **CA6040**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **3rd**	Semester: **VI**

UNIT-I

Introduction and Components:

Features and role of railways in transportation, Suitability of different gauges, Typical cross sections, Components of permanent way- Rails, Sleepers, Ballast, and Fixtures- functions, types requirements and failures, Coning of wheels, Tractive resistances.

UNIT-II

Geometric Design of Railway Tracks:

Geometric design of tracks- speed calculations, Gradients- ruling, momentum, pusher and minimum gradient, Super elevation, Cant Deficiency, Negative super elevation, Component of turn outs, points and crossings.

UNIT-III

Railway Station and Yards:

Station yards, Signalling and Interlocking, Level crossings.

UNIT-IV

Airport Characteristics:

Features and role of Airways in transportation, Air transportation planning, Site selection, Airport components and layout, Wind rose diagram, Basic runway length, and corrected runway length, Salient features of runway design.

UNIT-V

Geometric Design and Air Traffic Control:

Determination of turning radius of taxiway, Exit taxiway- design factors and elements, Airport markings and lightings, Air traffic control, Instrument landing systems

Text Book:

1. Saxena, S. C., Arora, S. P., "A Text Book of Railway Engineering", DhanpatRai Publications Pvt. Ltd., New Delhi, 6th Edition, 2001.
2. Khanna, S. K., Arora, M. G., and Jain, S. S., "Airport Planning and Design", Nem Chand and Bros., Roorkee, 6th Edition, 2008.

Reference Books:

1. Horonjeff, R. M., Mckelvey, F. X., Sproule, W. J., and Young, S., "Planning and Design of Airports", Mc-Graw Hill Publications, New Delhi, 5th Edition, 2010.
2. Chandra, S., and Agrawal, M. M., "Railway Engineering", Oxford University Press, 2007.
3. Chandra, S., and Kumar, V., "Airport Engineering",

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Principles of Management**	Course Code: **HA5010**
Credit: 2	L **2** T **0** P **0**
Year: **3rd**	Semester: **VI**

UNIT – I **5L**

Overview of Management: Definition of management, need for management, role of managers, Management as science and art, evolution of management thought, contribution of Taylor and Fayol, Types of business organizations, Levels of management

UNIT – II **9L**

Planning: Definition of planning, steps involved in planning, types of planning, objectives, process of managing by objectives, Strategy, types of strategies, Policy, types of policies, Decision making, types of decision making process.

UNIT – III **10L**

Organizing: Nature, purpose and structure of organization, formal and informal organization, Departmentation, its importance, basis of departmentation, Line and staff authority, Centralization and decentralization, Authority and responsibility, delegation of authority
Selection and recruitment, orientation, appraisal, HRD.

UNIT – IV **8L**

Directing: Creativity and innovation, Motivation, hierarachy of needs, motivation theories, Leadership – definition, elements, styles, leadership theories
Organization culture, elements and types of culture, managing cultural diversity.

UNIT – V **8L**

Controlling: System and process of controlling, requirements of effective control, Types of control, cost control, purchase control, maintenance control, quality control, planning operations
Globalization and liberalization.

Reference Books:

1. Charles W. L. Hill and Steven McShane, "Principles of Management", McGraw Hill Education, Special Indian edition, 2007.
2. R. N. Gupta, "Principles of Management ", S Chand Limited, 2007.
3. P. C. Tripathy and P. N. Reddy, " Principles and Practices of Management", Tata McGraw Hill, 1999
4. Joseph L. Massie, "Essentials of Management" , Prentice Hall of India, 2003.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Project Phase – I**	Course Code: **CA6110**
Credit: 2	L T P **0 0 4**
Year: **3rd**	Semester: **VI**

Major Project work will be allotted in the VI Semester which will continue through VII Semester and will be completed in VIII Semester.

Course Title: **Structural Analysis Lab**	Course Code: **CA6120**
Credit: 1	L T P **0 0 2**
Year: **3rd**	Semester: **VI**

List of Experiments

1. Redundant Joint Apparatus
2. Elastically Coupled Beam Structure
3. Deflection of Truss Apparatus
4. Three Hinged Arch Apparatus
5. Beam Model
6. Two Hinged Arch Apparatus
7. Elastic Properties of Deflected Beam Apparatus
8. Column Apparatus
9. Portal Frame Apparatus
10. Curved Member Apparatus

Course Title: **Aptitude Building - II**	Course Code: **CA6310**
Credit: 1	L T P **0 0 2**
Year: **3rd**	Semester: **VI**

Course Title: **Value Addition Training**	Course Code: **CA6320**
Credit: 2	L T P **2 0 0**
Year: **3rd**	Semester: **VI**

Comprehensive training on any one of this software like

1. STAAD. Pro
2. Microsoft Project
3. Revit Architecture
4. MX Road
5. ERDAS (Image processing) / ILWIS (Open source)
6. ARC GIS / QUANTAM GIS

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Bridge Engineering**	Course Code: **CA7010**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VII**

UNIT -I

Introduction:
Definition, Components of bridge, Historical Developments, Site Selection for bridges, classification of bridges, Survey and data collection for a bridge site selection, Hydraulic design, Design Discharge, Linear waterway, Economical span.

UNIT –II

Specifications of Road Bridges:
Indian road Congress Bridge code, carriageway, clearance, forces on bridge, review of IRC loadings, applications of loads on bridge such as dead load, impact load, live load etc.

UNIT-III

R.C.C. Slab Culvert:
RCC Slab culvert, dead load BM and SF,BM and SF for IRC class AA tracked vehicle, BM and SF for IRC class AA wheeled vehicle, BM and SF for IRC Class A loading, structural design of slab culvert.

UNIT-IV

T-Beam Bridge:
Proportioning of components, analysis of slab using IRC class AA tracked vehicle, structural design of slab, analysis of cross girder for dead load and IRC class AA tracked vehicle, structural design of cross girder, analysis of main girder using COURBON'S method, calculation of dead load and SF, calculation of live load BM and SF using IRC class AA tracked vehicle, structural design of main girder.

UNIT –V

Substructure, Foundations, Bearings, Joints and Appurtenances:
Definition of pier and abutment, design and drawing of pier and abutments, scour at abutments and pier, types of foundations, pile, well and pneumatic caissons, importance of bridge bearings, sketches of different types of bearings.

Text books:

1. Raju, N. K., "Design of bridges", Oxford and IBH publishing Co., New Delhi.
2. Victor, J., "Essentials of bridge engineering", Oxford and IBH publishing Co., New Delhi, 3rd Edition, 1980.

References books:

1 Bindra, S. P., "Principles and practice of bridge Engineering", Dhanpat Rai and Sons, New Delhi, 7th Edition, 1992.

2 "IRC 6-1966 Standard Specifications and code of practice for Road Bridges Section II loads and stresses", The Indian Road Congress, New Delhi.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Estimation & Costing**	Course Code: **CA7020**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VII**

UNIT –I

Introduction & Estimation of Buildings:

Importance of estimation in Civil Engineering, Different types of Estimates, methods in Estimation, Study of various drawings with estimates, Concept of measurement, units of measurement. Methods of taking out quantities and cost by Centre line method and long wall and short wall method. Preparing of detailed estimates and abstract for the building, flat and sloped roof. Estimate of repair works and demolition of Civil Engineering structures.

Unit –II

Estimation of R.C.C. Structures:

Estimates of components RCC works in beams, column footings and roof slabs, Estimation of septic tank, manhole and RCC slab culverts. Estimation of industrial building with steel truss, Estimation of framed structures.

UNIT-III

Specifications and Rate Analysis:

Definition of specifications, objectives of writing specification, essentials of specification of various items of working in buildings. Importance working out quantities and rates for the following standard items of works-earth works in different types of soils, cement concrete of different mixes, Brick masonry, Stone masonry, Plastering, Painting and steel works, wooden works for doors, windows and ventilator.

UNIT-IV

Estimation of Earth Work and Road Projects:

Methods for computation of Earthwork-cross sections-mid sections formula, trapezoidal and average end area or mean sectional formula, proportional formula for different terrains. Estimation of Road Works - WBM, Bituminous mixes and cement concrete roads.

UNIT-V

Contracts and Tender:

Types of contract, essential of contracts agreement and document- legal aspects, penal provisions on breach of contract. Tender- E.M.D, Security deposit, Tender form, Tender notification procedures, Administrative Approval, Technical approval/sanction, Nominal muster roll, Measurement book-procedure for recording and checking measurements, Stores and records maintaining.

Text books:

1 Chakraborti, M., "Estimating, Costing, Specification and Valuation in Civil Engineering", Published by author, Calcutta.
2 Dutta, B. N., "Estimating and Specification" UBS publishers and distributors, New Delhi, 2002.

Reference Books:

1. Basin, P. L., "Quality surveying", S. Chand and Co., New Delhi.
2. Rangawala, S. C., "Estimating and Specification", Charotar publishing House, Anand.
3. Nanavati, J., "Professional Practice for Civil engineers".

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Water Resources Engineering**	Course Code: **CA7030**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VII**

UNIT -I

Principles of water Management:- Introduction, definition, necessity of irrigation, physical properties of soils, soils classification, Indian soils, soil water relationship. Frequency of irrigation. Water requirement of crop. Duty, delta and Base period. Quality of water for irrigation. Irrigation efficiencies.

UNIT –II

Method of irrigation: Introduction. Surface irrigation methods: furrow irrigation method. Subsurface irrigation: Drip or trickle method. Overhead irrigation- types of sprinklers. Bandhara irrigation: site selection, section of Bhandhara, advantage and disadvantages.

UNIT-III

Irrigation channels: introduction**,** classification, component of canal system. Design of channels on alluvial soils Kennedy and Lacey theory, Lined channels.

UNIT-IV

Reservoirs: Introduction. types of reservoir, selection of site for reservoir, investigation of reservoir and dam site, Definition of general term. Reservoir capacity from mass curve. Life of reservoir and its computation. Water losses from reservoir. Principles of reservoir operation.

UNIT –V

Head Works and Canal Structures: Layout, components, canal regulators: function and types of regulators. Canal drops component and types of canal drop. Hydraulic design for a notch type of drop. Cross drainage works: classification, hydraulic design principles for an aqueduct.

Text books:

1 Modi., P. N., "Irrigation water resources and water power engineering", Standard Book House, New Delhi.

2 Garg, S. K., "Irrigation engineering and hydraulic structures", Khanna Publishers, New Delhi, 23rd Edition, 2009.

References Books:

1 Sharma, R. K., "Text Book of Irrigation Engineering and Hydraulic Structures", Oxford and IBH Publishing Co., New Delhi, 1984.

2 SahasraBudhe, Irrigation Engineering and Hydraulic Structures", Dhanpat Rai Publication Ltd., New Delhi.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Construction Management**	Course Code: **CA7040**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VII**

UNIT-I

Network Techniques:
Introduction to network techniques, Use of Computer aided CPM and PERT for planning, Scheduling and control of construction works, Bar charts, Error in networks, Types of nodes and node numbering systems.

UNIT-II

Construction Planning:
Planning for construction and site facilities using networks, Preparation of construction schedules for jobs, materials, equipment, labour and budgets using CPM.

UNIT-III

Construction Equipment and Methods:
Equipment for earthworks, Concrete construction, Aggregate production, Concrete production, Handling and placement, Mixers, Vibrators and temperature control.

UNIT-IV

Control on Construction:
Construction quality control and inspection, Significance of variability and estimation of risk, Construction cost control, crashing of networks. Resource planning and scheduling

UNIT-V

Safety in Construction: Introduction, Evolution of safety, Cause of accident, injury. Principle of safety, safety act and regulations, roles of safety personnel, safety management system.

Text Book:

1. Shrivastav, U. K., "Construction Planning Management", Galgotia Publications.
2. Peurifoy, R. L., "Construction Planning, Equipment and Methods", McGraw Hill Publication, New Delhi, 7th Edition, 2013.
3. Jha, K. N., "Construction Project Management: Theory and Practice", Pearson Publication, New Delhi, 2012.

Reference Books:

1. Ahuja, H. N., "Construction Performance Control by Networks", John Wiley & Sons, 1976.
2. Satyanarayna, B., Saxena, S. C., "Construction, Planning and Equipment", Standard Publishers, 3rd Edition, 1985.
3. Moder, J. J., Phillips, C. R., "Project Management with CPM and PERT", Van Nostrand Reinhold Co., 2nd Edition, 1970.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Pre-stressed Concrete (*Elective – I*)**			Course Code: **CA7610**
Credit: 3.5	L	T	P
	3	**1**	**0**
Year: **4th**			Semester: **VII**

UNIT-I

Materials, Basic Principles of Pre-Stressing, Prestressing Systems: Basic concepts of prestressing, High strength concrete and steel, Stress-strain characteristics and properties, Various prestressing systems, Pre-tensioning and Post- tensioning systems with anchorages, Advantages and limitations of prestressed concrete.

UNIT-II

Analysis of Sections for Flexure: Basic assumptions, Analysis of stresses in concrete due to pre- stress and loads for different types of cross section, Pressure line or thrust line, Cable profile, Concept of load balancing, Cracking moment.

UNIT-III

Losses of Pre-Stress & Deflections: Nature of losses in pre-stress, Various losses encountered in pre-tensioning and post tensioning methods, Deflection, Factors influencing deflection, Elastic deflection under transfer loads and due to different cable profile. Deflections limits as per IS-1343. Effects of creep on deflection crack widths.

UNIT-IV

Flexural and Shear Strength of Prestressed Concrete Sections: Types of flexural failure, IS code recommendations for flexure, Ultimate flexural strength of section. Shear and principal stresses, Ultimate shear resistance of prestressed concrete members, Shear reinforcement.

UNIT-V

Transfer of Prestress in Pre tensioned Members and Anchorage Zone Stresses in Post Tensioned Members: Transmission of pre-stress in pre-tensioned members, Transmission length, Bond stresses, Codal provisions for bond and transmission length, Anchorage stress in post- tensioned member. Bearing stress and bursting tensile force, IS code provisions.

Text Books:

1. Raju, N. K., "Pre-stressed concrete", Tata McGraw Hill, New Delhi, 1st Edition, 2012.
2. Ramamruthum, S., "Pre-stressed Concrete", DhanpatRai Publishing Company (P) Ltd., New Delhi, 2003.
3. Lin, T. Y., Burns, N. H., "Design of pre- stressed Concrete Structures", John Wiley and Sons. New York, 3rd Edition, 1981.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Ground Water Engineering (*Elective – I*)**	Course Code: **CA7620**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VII**

UNIT-I

Introduction:

Groundwater occurrence and its role in hydrologic cycle, Various usage of ground water Groundwater bearing formations, Attributes of an aquifer, Aquifer classification, Flow and storage characteristics of various types of aquifers, Recharge Processes, Storage release mechanism. Indian Scenario.

UNIT-II

Ground Water Flow in Cartesian Coordinates:

Differential Equations governing groundwater flow in Cartesian coordinates, Dupuit-Forchheimer assumptions, Analytical solutions, Numerical solutions, Regional groundwater planning, Stream-aquifer interflows,

UNIT-III

Ground Water Flow in Polar Coordinates:

Differential Equations governing groundwater flow in Polar coordinates, Well hydraulics, Analytical solutions for confined, leaky confined and unconfined aquifers, Image well theory, Time-variant pumping rates, Well interference, Analysis of pumping test data.

UNIT-IV

Wells and Ground Water Recharge:

Construction of wells, Various drilling techniques, Estimation of recharge, Flow in unsaturated zone, Experimental methods, Artificial recharge, Induced recharge, Roof water harvesting

UNIT-V

Contamination of Ground Water:

Contamination of ground water, Quality parameters and standards, River bank infiltration, Sea water intrusion

Text Book:

1. Todd, D. K., "Ground Water Hydrology", John Wiley & Sons, 1980.
2. Raghunath, H. M., "Ground Water", New Age International, 2007.

Reference Books:

1. Walton, W.C., "Ground Resource Evaluation", McGraw Hill, New Delhi, 1970.
2. Bear, J., "Hydraulics of Ground Water", McGraw-Hill International Book Co., 1979.
3. Bouwer, H., "Ground Water Hydrology", McGraw-Hill.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Environmental Risk Assessment and Disaster Management (*Elective – I*)**			Course Code: **CA7630**
Credit: 3.5	L	T	P
	3	**1**	**0**
Year: **4th**			Semester: **VII**

UNIT-I

Environmental attributes and assessment:

Introduction and Scope utility of the Environmental Impact Assessment process, expended and narrowed scope of Environmental Impact Assessment, impacts of development activities, planning and management of impact studies. Environmental attributes and environmental indices and indicators, environmental assessment, methods and techniques, matrices, network and checklist methods, prediction techniques for quality of environmental attributes

UNIT-II

Environmental Impact and Risk Assessment:

Impact evaluation, assessment of impact on air, water, soil and ground water, noise, biological environment. Assessment of impact on socio-economic environment, evaluation methods, mitigation measures. Health risk assessment, Hazard identification, toxicology and dose response characterization, exposure characterization, risk characterization, uncertainty in estimates. Risk evaluation, risk acceptance, basic principles of health risk management.

UNIT-III

Understanding Disasters:

Meaning, nature, characteristics and types of Disasters, Causes and effects, Disaster: A Global View, Disaster Profile of India, The Disaster Management cycle.

Geological and Mountain Area Disasters: Earthquakes, Volcanic eruption, Landslides, Snow Avalanches. Wind and Water Related Natural Disaster: Floods and Flash Floods, Droughts Cyclones, Tsunamis. Man Made Disasters: Understanding Man Made Disasters: Fires and Forest Fires, Nuclear, Biological and Chemical disaster, Road Accidents.

UNIT-IV

Disaster Management:

Disaster Management: Prevention, Preparedness and Mitigation. Roles and responsibilities of different agencies and Government. Technologies for Disaster Management. Disaster Mitigation Strategies.

Text Books:

1. Jain, R. K., "Environmental Impact Assessment", John Wiley, 1978.
2. Paustenbach, D. A., "Risk Assessment: A text Book of Case Studies", John Wiley; 1992.
3. Edward, B., "Natural Hazards", Cambridge University Press, U.K., 2005.
4. Sharma, R.K. & Sharma, G., "Natural Disaster", APH Publishing Corporation, New Delhi, 2005.

Reference Books:

1. Kenneth, W., Werner, F. C., Davis W. T., "Air Pollution: Its Origin and Control", 3rd Edition, Prentice Hall.
2. Mishra, P. C., "Fundamentals of Air and Water Pollution", South Asia Books, 1990.
3. Masters, G., "Introduction to Environmental Engineering and Science", Prentice Hall of India, 2004.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Project Phase - II**	Course Code: **CA7110**
Credit: 2	L **0** T **0** P **4**
Year: **4th**	Semester: **VII**

Major Project work allotted in the VI Semester will continue through VII Semester and will be completed in VIII Semester.

Course Title: **Industrial Training and Presentation**	Course Code: **CA7510**
Credit: 1	L **0** T **0** P **2**
Year: **4th**	Semester: **VII**

During Summer Vacation after VI th semester students are compulsorily required to attendIndustrial Training of 6-8 weeks which will beevaluated in VII Semester under Industrial Training Presentation (CA7510).

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Hydraulic Structures**	Course Code: **CA8610**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VIII**

UNIT-I

Introduction:
Hydraulic structures for water resources projects.

UNIT-II

Embankment and Gravity Dams:
Embankment Dam: Types, design considerations, seepage analysis and control, stability analysis, construction techniques.
Gravity Dam: Forces acting on failure of a gravity dam, stress analysis, elementary profile, design of gravity dam, other functional features of a gravity dam

UNIT-III

Spillways:
Types and their design, spillway gates, Cavitations, Aerators and energy dissipation (terminal structures)

UNIT-IV

Channel Transitions:
Design principles for subcritical and supercritical flows.

UNIT-V

Hydropower plant:
Terms relating to hydropower, basic design aspects of different unit of hydropower plant

Reference Books:

1. Singh, B., "Fundamentals of Irrigation Engineering", Nem Chand & Bros, 9th Edition, 1997.
2. Asawa, G. L., "Irrigation Engineering", New Age International, 2nd Edition, 1996.
3. RangaRaju, K. G., "Flow through open Channels", Tata McGraw-Hill, 2003.
4. Subramanya, K., "Flow in Open Channels", Tata McGraw-Hill, 2nd Edition, 2000.
5. Chow, V. T., "Open Channel Hydraulics", McGraw-Hill, 1959.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Hydro Power Engineering**	Course Code: **CA8620**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VIII**

UNIT-I

Introduction:

Prospects of hydropower, Sources of energy, Hydropower potential, Distribution and development, Basin wise development of hydropower, Constraints in hydropower development.

UNIT-II

Stream Flow Data and Hydropower Potential:

Flow and load duration curves, Estimation of flow duration curve on un gauged site, Primary and secondary power, Storage and pondage, Load factor, Capacity factor, Utilization factor, Diversity factor.

UNIT-III

Types of Hydropower Plants:

Base and peak load hydropower plants, Run-of- river plants, Valley dam plants, Diversion canal plants, High head diversion plants, Pumped-storage power plants.

UNIT-IV

Intake Structures and Conveyance System:

Functions of intake structures, Its locations and types, Trash rack dimensions, Design, Spacing of bars, Methods of cleaning, Design of transition, Power canal-location site, Surges in canals, Penstocks types, Design and layout, Economical diameter of penstock, Hydraulic losses, Branches, Airvent, Forebay,

UNIT-V

Small Hydro Power Plant Development:

Benefits and potential of small hydropower plants, Components of small hydropower plants, Trench weir, Desilting tank and turbines

Text Book:

1. Varsney, R. S., "Hydro Power Structures", Nem Chand & Bros, 5th Edition, 2010.
2. Warnick, C.C., "Hydropower Engineering", Prentice Hall, 1984.

Reference Books:

1. Barrow, H. K., "Water Power Engineering", Tata McGraw-Hill.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **River Engineering**	Course Code: **CA8630**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VIII**

UNIT-I

Elements of River Geomorphology:
Origin and properties of sediments, river problems, control of vegetation and river morphology.
Stable channel and their geometry, flow around river bends, braided river and meandering river

UNIT-II

Soil Erosion and Sediments Yield:
Types of erosion, mechanism of soil erosion, sediment delivery ratio, and process based modeling of soil erosion.

UNIT-III

Hydraulics of Streams:
Incipient motion, modes of sediment transport, bed-forms, resistance to flow in alluvial rivers, bed load transport, suspended load transport, Hydraulics geometry of gravel bed rivers, armouring, bed forms and resistance to flow in gravel bed rivers.

UNIT-IV

Bed Level Variations in Streams:
Degradation, local scour, Aggradations, Reservoir sedimentation, mathematical modeling for river bed variations

UNIT-V

Rivers and Environment:
Environmental effects of hydraulic structures, Structures, River Pollution, River action Plans, Stream restoration

Reference Books:

1. Garde, R. J., "River Morphology", New Age International, 2006.
2. Julin, P. Y., " Erosion and Sedimentation", Cambridge University Press, 1998.
3. Jansen, P. P. H., " Principles of River Engineering", VSSD Publications, 1994.
4. Rosgen, D., "Applied River Morphology", Wildland Hydrology books, Pagosa Springs, 1996.
5. Graf, W. H., Altinakar, M. S., "Fluvial Hydraulics: Flow and Transport Processes in Channels of Simple Geometry", John Wiley, 1999.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Water & Land Management**	Course Code: **CA8640**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VIII**

UNIT-I

Problems of irrigation systems in India & Soil, Water Plant Relationship

Problems of irrigation systems in India, Soil and Land Irrigability, classification, Basic concepts of diagnostic analysis.Evapotranspiration, crop coefficient, effective rainfall, crop water demand and availability, irrigation efficiencies.

UNIT-II

Irrigation scheduling & Micro level Planning:

Irrigation scheduling, Stressed irrigation, drought and water management policy during drought. Micro level Planning for any canal/tube well system, Evaluation of chak planning and design.

UNIT-III

Water application methods & Operation and maintenance of irrigation system:

Water application methods**,** Border irrigation, basin irrigation, furrow irrigation, sprinkler and drip irrigation. Operation and maintenance of irrigation system, rotational water distribution systems-arabandi. Evaluation of irrigation project's performance and improvement.

UNIT-IV

Evaluation and status of land development:

Evaluation and status of land development in irrigated commands, Norms of land leveling, methods of land leveling. Plane method or centroid method, contour adjustment method.

UNIT-V

Water Management for Irrigation:

Irrigation behaviour and decision making, Attitudes and their influence on irrigation management, night irrigation, participatory irrigation management, irrigation organizations.

Text Books:

1. Michael, A. M., "Irrigation: Theory and Practice", Vikas Publishing House Pvt Ltd, New Delhi, 2008.
2. Allen, R. G., Pereira, L. S., Raes, D., Smith, M., "FAO Irrigation and Drainage Paper: Crop Evapo-transpiration (guidelines for computing crop water requirements)", No. 56, Rome, Italy.
3. FAO Irrigation and Drainage Paper no. 24 & 58, Rome, Italy.
4. Asawa, G. L., "Irrigation and Water Resources Engineering", New Age International, New Delhi, 2006.
5. Mazumdar, S. K., "Irrigation Engineering", Tata McGraw Hill Publication, New Delhi.

Reference Books:

1. Diagnostic Analysis of Minor irrigation scheme, Publication no. 11, WALMI, Aurangabad (Maharashtra).
2. Application of soil survey in Irrigation Water Management, Publication no. 21, WALMI, Aurangabad (Maharastra).

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Air and Water Pollution**	Course Code: **CA8650**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VIII**

UNIT-I

Introduction:

Introduction and scope, Dispersion and interaction of pollutants, Air quality, Mass balance approaches, Box model approaches, Air quality dispersion-modeling approaches, Water quality, Mass balance approaches, Aquatic ecosystem modeling approaches, Air and water chemistry.

UNIT-II

Measurement of Air & Water Quality:

Different measurement methods, Monitoring and modeling of indoor and ambient air quality, Emission inventory, Key meteorological data, Pollution of surface and ground water resources and control mechanisms, Baseline monitoring of surface waters, Ground water quality, Mitigation measures.

UNIT-III

Impact of Air and Water Pollution:

Impact of air and water pollution on ecosystems, Mitigation measures, Carrying capacity of air and watersheds.

UNIT-IV

Quality Standards and Regulations:

Air and water pollution versus health risk and global climate change, Air and water quality standards, National and international regulations and legislations.

UNIT-V

Quality Management and Reclamation:

Air quality management, Reclamation of water bodies, Technology and policy options for controlling air and water pollution, Decision method for evaluation of alternatives.

Text Book:

1. Mishra, P. C., "Fundamentals of Air and Water Pollution", APH Publishing Corporation, 2008.
2. Kenneth, W., Warner, F. C. and Davis W. T., "Air Pollution, Its Origin and Control", Prentice Hall, 3rd Edition, 1997.

Reference Books:

1. Davis, M. L. and Cornwell, D. A., "Introduction to Environmental Engineering", McGraw-Hill, 5th Edition, 2012.
2. Chin, D. A., "Water Quality Engineering in Natural Systems:Fate and Transport Processes in the Water Environment, John Wiley, 2nd Edition, 2012.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Environmental Management & Sustainable Development**	Course Code: **CA8660**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VIII**

UNIT-I

Introduction:
Introduction and scope, Inter-linkages of energy-environment and economy from engineering infrastructure perspective.

UNIT-II

Ecology & Environmental Resources:
Concepts of ecology, Systems approach and sustainability engineering, Interaction between energy and environmental resources, Environmental quality standards and indices (Indian and International)

UNIT-III

Environmental Monitoring and Management:
Environmental monitoring, Analysis, Statistics and data interpretation, Environmental management system.

UNIT-IV

Environmental Impact Assessment:
Environmental impact assessment, Life cycle assessment and risk analysis of scientific and technological developments, Environmental audit.

UNIT-V

Sustainable Development:
Sustainable development within the context of global economy, Technology and climate change.

Text Book:

1. Mishra, P. C., "Fundamentals of Air and Water Pollution", APH Publishing Corporation, 2008.
2. Kenneth, W., Warner, F. C. and Davis W. T., "Air Pollution, Its Origin and Control", Prentice Hall, 3rd Edition, 1997.
3. Baker, S., "Sustainable Development", Routledge Publication, New York, 2008.

Reference Books:

1. Davis, M. L. and Cornwell, D. A., "Introduction to Environmental Engineering", McGraw-Hill, 5th Edition, 2012.
2. Chin, D. A., "Water Quality Engineering in Natural Systems: Fate and Transport Processes in the Water Environment, John Wiley, 2nd Edition, 2012.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Seismology & Earthquake Engineering**	Course Code: **CA8670**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VIII**

UNIT-I

Introduction:

Earthquake occurrences – Global Seismic Belt; Indian Seismic Zoning map, their engineering implications: Damage survey, seismic intensity, isoseismic maps, More commonly used earthquake parameters like epicenter, epicentral distance, origin time, focus, magnitude, frequency; Elementary information on seismic wave propagation. Demonstration of seismographs to explain earthquake recording

UNIT-II

Single Degree of Vibration Freedom System:

Introduction to vibration problems, Un-damped and Damped free vibration with viscous damping, Forced vibrations, Steady state, Vibration Isolation, Vibration Measuring Instruments, (Demonstration for determination of damping, frequency etc.), Response of un-damped systems to time dependent force functions (Pulse/impulses), Duhamel's Integral, Response to ground motion, Response spectra.

UNIT-III

Two Degree of Freedom System:

Determination of natural frequency and mode shapes, Steady state forced vibrations.

UNIT-IV

Multiple Degree of Freedom System:

Rayleight's Method - Determination of fundamental frequency of simple systems, free vibrations of undamped systems – Determination of frequency and mode shapes by Holzer method, Stodola Method, Evaluation of earthquake forces in multi-storeyed buildings using response spectra

UNIT-V

Earthquake Effects:

Ground failures, Local site effects, Effects on ground and structure, Land-slides, Cracks & collapse of structures, Types of failure of earth fill. Treatment of Damaged Fill

Text Books:

1. Chopra, A. K., "Dynamic of structures", Prentice Hall, 4th Edition, 2011.
2. Paz, M., Leigh, W., "Structural Dynamics: Theory and Computation", Springer, 5th edition, 2006.

Reference Books:

1. Krishna, J., Chandrasekran, A. R. and Chandra, B. "Elements of Earthquake Engineerng", South Asia Publisher, New Delhi, 2nd Edition.
2. Okamoto, S., "Introduction to Earthquake Engineering", University of Tokyo Press, Tokyo.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Advanced Structural Design**	Course Code: **CA8680**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VIII**

UNIT-I

Elastic analysis of R.C. beams and frames. Analysis and design of flat slabs; equivalent frame method, direct design method, deflection calculations.

UNIT-II

Analysis and design of deep beams.Design of grid floors and cylindrical shells.

UNIT-III

Analysis and Design of shear walls

UNIT-IV

Design of industrial buildings, bracing, gantry girders and stepped columns.

UNIT-V

Microwave towers, Chimney and transmission towers. Plastic design principle, High rise building

Text Books:

1. Jain, A. K., "Reinforced Concrete- Limit State Design", 6th Ed., Nem Chand & Bros, 2006.
2. Varghese, P. C., "Advanced Reinforced Concrete Design", Prentice Hall, 2001.
3. Pillai, S. D., Menon, D., "Reinforced Concrete Design", Tata McGraw- Hill, 2003.

Reference Books:

1. Agarwal, P., Shrinkhande, M., "Earthquake Resistance Design of Structures", Prentice- Hall of India, 2006.
2. Raju, N., K. "Advance Reinforced Concrete Design", CBS Publishers, 1986.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Finite Element Analysis**	Course Code: **CA8690**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VIII**

UNIT-I

Introduction: Basic concepts, Background review, Theory of elasticity, matrix displacement formulation, energy concepts, equilibrium and energy methods of analyzing structure, Rayleigh- Ritz method, Galerkin's method, simple application in structural analysis

UNIT-II

Fundamentals of Finite element Method: Displacement function and natural coordinate's construction of displacement function for 2D truss and beam element, application for FEM for the analysis of truss, continuous beam and simple frame problems.

UNIT-III

Analysis of 2D continuum Problems: Element and shape function, Triangular, rectangular and quadrilateral element, different type of element, their characteristics and suitability for application, polynomial shape function, Lagrange's and Hermitian polynomial, compatibility and convergence requirements of shape functions.

UNIT-IV

Theory of Isoperametric Element: Isoparametric, sub-parametric and super-parametric elements, characteristics of isoparametric quadrilateral elements.

UNIT-V

Introduction to plate bending problems and techniques: Introduction to plate bending problems and techniques for nonlinear analysis, Structure of computer program for FEM analysis, description of different modules, pre and post processing.

Text Book:

1. Krishnamoorthy, C. S., "Finite Elements Analysis-Theory and Programming", Tata McGraw Hill Co. Limited, New Delhi.
2. Abel, J. F., Desai, C. S, "Introduction to the Finite element Method", Affiliated East West Press Pvt. Ltd., New Delhi.

Reference Books:

1. Bathe, K. J, "Finite Elements Procedure", PHI Pvt. Ltd, New Delhi.
2. Zienkeiwicz, O. C., "The Finite Element Method", Tata McGraw Hill Co. Limited, New Delhi.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Numerical Techniques**	Course Code: **JA4610**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VIII**

Unit I:
Introduction to numerical computing; Approximations and Errors in numerical computations; Truncation and Round off errors; Propagation of errors; Root finding: Bisection method; Regula-falsi method; Iteration method; Newton Raphson method; Rate of convergence of above methods.

Unit II:
Matrix algebra; Solution of simultaneous linear algebraic equations: Gauss elimination; Gauss Jordan method; LU Decomposition method; Jacobi method; Gauss Seidel method.

Unit III:
Interpolation and Extrapolation: Finite differences; Difference table; Newton's forward and backward interpolation formula; Divided differences and Newton's divided difference formula; Numerical differentiation; Numerical integration: Trapezoidal; Simpson's rules and Weddle's formula.

Unit IV:
Numerical solution of O.D.E.: Taylor series method; Euler's method; Modified Euler's method; Forth order RungeKutta methods; Multistep methods: Milne's method; Adams Bashforth method.

Text Books:

1. **Introductory Methods of Numerical Analysis,** S.S. Sastry, PHI learning Pvt. Ltd, 4th edition, 2005.
2. **Numerical Methods for Scientific and Engineering computation,** M.K Jain, S.R.K Iyengar and R.K Jain, New age International Publishers, 4th Edition, 2003.

Reference Books:

1. **Numerical Methods in Engineering and Science,** B. S. Grewal, Khanna Publishers, New Delhi, India, (9th Edition), 2010.
2. **Applied Numerical Analysis,** Curtis F. Gerald and Patrick O. Wheatley**,** Pearson Education Lt, 7th Edition, 2009.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Traffic Engineering & Management**	Course Code: **CA8600**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VIII**

UNIT-I

Fundamentals of traffic flow:
Characteristics of traffic engineering elements- vehicle, driver, road; Fundamentals of traffic flow- speed, density, flow and their relationship. Uninterrupted traffic flow- data collection, different models related to traffic flow; Interrupted traffic flow- shock wave, flow at signalized and un-signalized intersections; Delay and queue analysis.

UNIT-II

Traffic facilities:
Intersections – signalized and un-signalized. Interchanges – types, warrant. Parking – different types, Road signs, Road markings, Bus terminals.

UNIT-III

Transportation planning process:
Goals, objectives; Transportation needs; Generation, evaluation of alternatives and their implementation.

UNIT-IV

Travel demand analysis:
Introduction, nature and analysis of travel demand, Data collection, Four stage transportation models, Trip generation, trip distribution, modal split and traffic assignment.

UNIT-V

Public Transport System:
Para-transit, transit and rapid transit systems Route development – properties and development of route; Bus stop location, Schedule development – properties, schedule determination of single route transit system.Multi modal transport system.

Text Books:

2. Flaherty, C. A. O., "Transport Planning and Traffic Engineering", Butterworth-Heineman.
3. Chakroborty, P., Das, A., "Principle of Transportation Engineering", Prentice Hall of India Pvt. Ltd.
4. Vuchic, V. R., "Urban Transit Systems and Technology", Wiley, 1st Edition, 2007.

Reference Books:

1. May, D. A., "Traffic Flow Fundamentals", Prentice Hall, 1st Edition, 1990.
2. Slin, M., guest, P. and Matthews, P., "Traffic Engineering Design: Principles and Practice", 2nd Ed., Butterworth-Heinemann.
3. Garder, N.J. and Hoel, L.A., "Traffic Engineering", Brooks/Cole,Pacific Grove, 3rd Ed.
4. Highway Capacity Manual, 2000.

Department of Civil Engineering
Course Structure for B.Tech. (Civil Engineering)
Batch: 2016-20

Course Title: **Advanced Highway Engineering**	Course Code: **CA86A0**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VIII**

UNIT-I

Introduction:
National Road Development Program, Bombay Plan, Lucknow Plan, IRC Vision- 2021 and Rural Road Vision- 225, Comparison and significance, financial analysis of highway projects, Vehicle Operating Cost.

UNIT-II

Road Materials:
Tests on soil (plate load, CBR and Triaxial), strength of pavement materials, importance and functions of each layer of pavement and subgrade, Alternate forms of aggregates, theory of specifications of fillers, additives, emulsions, cutbacks and modifies binder, Mix designs- Marshall, Hubbard Field and Hveem Method, Requirement of a mix.Stabilized Roads: Aggregate mixtures, Proportioning, types of stabilizations, advantages and limitation, special problems related to drainage, control of seepage and capillary rise

UNIT-III

Design of Flexible Pavements:
Design of Flexible Pavements: Design factors, empirial, semiempirical and analytical design methods, California bearing ratio, Triaxial, Mclead and Burmister method, advantages and limitations, IRC method of design.

UNIT-IV

Design of Rigid Pavements:
Design of Rigid Pavements: Design factors, load and temperature stresses, load transfer devices, design of Dowel and Tie bars, Joint requirement and working, IRC methods of design of SFRC pavements, construction techniques and specifications, quality control tests, continuously reinforcedconcrete pavements.

UNIT-IV

Pavement Evaluation Techniques and Maintenance:
Benkelman beam deflection method, flexible and rigid overlays. Routine and periodic maintenance, special repairs, maintenance management system, case study of failure of flexible and rigid pavements.

Reference Books:

1. Yodar, E. J., "Principle of Pavement Design", Wiley, 2nd Edition.
2. Statinery Off., H. M., "Bituminous Material in Road Construction", Road Research Laboratory, 1962.
3. Kerbs, R. D., and Walker, R. D., "Highway Materials", McGraw-Hill, 1971.
4. Khanna, S. K., Justo, C. E. G., "Highway Engineering", Nem Chand and Bros, 2001.
5. Huang, Y.H., "Pavement Analysis and Design" Prentice Hall.
6. Wright, P. H., Dixon, K. K., "Highway Engineering", John Wiley, 2004.
7. Kadiyali, L.R. and Lal, N. B., "Principles and Practices of Highway Engineering", Khanna Publishers, 2006.
8. ASTM Standards Handbooks.

DIT UNIVERSITY
Dehradun

Course Structure & Detailed Syllabus

of

B. Tech. in Computer Science & Engineering

Batch 2016-20

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Year: 1st **Semester: I**

Course Code	Course Title	L	T	P	Credit
JA1010	Engineering Mathematics-I	3	1	0	3.5
OA1210	Engineering Physics	3	1	2	4.5
LA1210	Essentials of Mechanical Engineering	3	1	2	4.5
HA1210	Professional Communication-I	3	1	0	3.5
DA1210	Computer Fundamental & C Programming	3	0	2	4
BA1010	Environmental Science	2	0	0	2
LA1220	Engineering Graphics	1	0	2	1
HA1310	Soft Skills Development	0	0	2	1
	Total				**24**

Year: 1st **Semester: II**

Course Code	Course Title	L	T	P	Credit
JA2010	Engineering Mathematics-II	3	1	0	3.5
BA1210	Engineering Chemistry	3	1	2	4.5
EA1210	Introduction to Electrical Engineering	3	1	2	4.5
FA1210	Introduction to Electronics & Communication	3	1	2	4.5
HA2210	Professional Communication-II	3	0	1	3.5
DA2210	Computer Programming in C++	3	0	2	4
LA1110	Workshop Practice	0	0	2	1
	Total				**25.5**

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Year: 2nd **Semester: III**

Course Code	Course Title	L	T	P	Credit
DA3210	Data Structures	3	0	2	4
DA3220	Computer Based Numerical and Statistical Techniques	3	0	2	4
DA3230	Programming with Java	3	0	2	4
DA3010	Discrete Mathematics	3	1	0	3.5
DA3020	Computer Organization	3	1	0	3.5
FA3221	Digital System Design	3	1	2	4.5
	Total				**23.5**

Year: 2nd **Semester: IV**

Course Code	Course Title	L	T	P	Credit
DA4010	Theory of Computation	3	1	0	3.5
FA52A0	Microprocessor	3	1	2	4.5
DA4210	Computer Networks	3	0	2	4
DA4220	Web Technology	3	0	2	4
DA4230	Database Management System	3	0	2	4
DA4242	Linux Administration & Shell Programming	3	0	2	4
DA4310	Value Addition Training	0	0	2	1
DA4410	Industrial Tour	0	0	2	1
	Total				**26**

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Year: 3rd **Semester: V**

Course Code	Course Title	L	T	P	Credit
JA5010	Probability & Random Variables	3	1	0	3.5
DA5020	Operating Systems	3	1	0	3.5
DA5210	Algorithms: Analysis & Design	3	0	2	4
DA5220	Advanced Java Programming	3	0	2	4
DA5230	Artificial Intelligence 2018	3	0	2	4
HA5010	Principles of Management	2	0	0	2
DA5310	Aptitude Building – I	0	0	2	1
	Total				**22**

Year: 3rd **Semester: VI**

Course Code	Course Title	L	T	P	Credit
DA6210	Computer Graphics	3	0	2	4
DA6220	Dot Net Technologies	3	0	2	4
DA6230	Compiler Design	3	0	2	4
DA6010	Software Engineering	3	0	0	3
GC5010	Engineering Economics	2	0	0	2
	Elective -I	3	0	0	3
DA6310	Aptitude Building – II	0	0	2	1
DA6110	Project Phase I	0	0	4	2
	Total				**23**

After VI semester student will undergo minimum 6 weeks Industrial Training which will be evaluated in the VII semester.

List of Elective Subjects for VI Semester

Cloud		Machine Learning		Gaming & Animation		Core CSE	
Fundamental of Cloud Computing	DA6610	Genetic Algorithms & Probabilistic Reasoning	DA6620	Game Design & Development	DA6630	Mobile Computing	DA6640
						Data Base Administration	DA6650

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Year: 4th Batch: 2016-20 Semester: VII

Course Code	Course Title	L	T	P	Credit
DA7010	Distributed Computing	3	1	0	3.5
DA7020	Advanced Computer Architecture	3	1	0	3.5
DA7210	Cryptography and Network Security	3	0	2	4
DA7030	Data Warehousing and Mining	3	1	0	3.5
	Elective -II	3	0	2	4
DA7510	Industrial Training and Presentation*	0	0	8	4
DA7110	Project Phase II	0	0	4	2
	Total				**24.5**

List of Elective Subjects for VII Semester

Cloud		Machine Learning		Gaming & Animation		Core CSE	
Cloud Application development & Storage Virtualization	DA7660	Statistical Machine Learning	DA7670	Game Engine Architecture	DA7630	Digital Image Processing	DA7640
						Advanced Computer Networks	DA7650

Note: * The student shall undergo 'Industrial Training' during Summer Vacations and shall prepare the Report and Make a Presentation during this semester.

Year: 4th Semester: VIII

Course Code	Course Title	L	T	P	Credit
DA8010	Business Intelligence	3	1	0	3.5
DA8040	Real Time Systems	3	1	0	3.5
DA8050	Cyber Law & IPR	3	0	0	3
	Elective – III	3	0	0	3
	Open Elective	3	0	0	3
DA8110	Project Phase -III	0	0	8	4
	Total				**20**

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

List of Elective Subjects for VIII Semester

Cloud		Machine Learning		Gaming & Animation		Core CSE	
Security in Cloud Computing	DA8660	Machine Learning & Neural Networks	DA8670	Computer Animation	DA8640	Computer Vision	DA8630
						Software Testing	DA8650

List of Open Electives (To be conducted in VIII Semester)

Sl. No.	Branch	Subject Code	Name of Elective subjects
1	Physics	OA8710 OA8720	1. Nano Scale Science and Technology 2. Photonics Technology
2	EE	EA8710 EA8720	1. Non-Conventional Energy Resources 2. Instrumentation and Process control
3	ME	LA8710 LA8720	1. Entrepreneurship development 2. Quality Management
4	Civil	CA8710 CA8720	1. Environment and Ecology 2. GIS
5	CSE	**DA8740** DA8710	1. Management Information System (MIS) 2. Business Intelligence
6	IT	IA8730 IA8721	1. Internet of Things 2. IT In Business
7	ECE	FA8710	1. Consumer Electronics
8	Humanities	HA8710 HA8720	1. Industrial Psychology 2. Human Values and Ethics
9	MBA	GA8710 GA8730 GA8740	1. Organizational Behavior 2. Digital Marketing 3. Financial Modeling with Spread sheet

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **Engineering Mathematics-I**			Course Code: **JA1010**
Credit: **3.5**	L **3**	T **1**	P **0**
Year: **1st**			Semester: **I**

UNIT I: Differential Calculus-I [**9**]

Functions of single variable: Limit continuity and differentiability; Indeterminate forms; Mean value theorems; Role's Theorem; Taylor's theorem with remainders; Curve tracing.

UNIT II: Differential Calculus-II [**9**]

Successive differentiation; Leibnitz theorem; Partial differentiation; Euler's theorem; Expansion of functions of several variables; Extrema of functions of several variables; Lagrange's method of multipliers.

UNIT III: Integral Calculus [**9**]

Improper integral-Beta and Gamma functions; Double and Triple integrals; change of order of integration; change of variables; Dirichlet's integral and its applications; Application of multiple integral.

UNIT IV: Vector Calculus [**12**]

Vector Differentiation: Scalar and vector fields; gradient of scalar point function; directional derivatives; divergence and curl of vector point function; solenoidal and irrotational vectors.

Vector Integration: line, surface and volume integrals; Green's theorem; Stokes' theorem and Gauss divergence theorem (without proof).

Text Books:

- R. K. Jain & S. R. K. Iyenger, **Advanced Engineering Mathematics**, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.

Reference Books:

- E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, John &Wiley Sons, U.K., 2006.
- B. S. Grewal, **Higher Engineering Mathematics**, 42th Edition, Khanna publication, New Delhi, India, 2012.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **Engineering Physics**	Course Code: **OA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **I**

UNIT I:
Relativistic Mechanics: Inertial and Non-inertial Frames; Postulates of Special Theory of Relativity; Galilean and Lorentz Transformation; Length Contraction and Time Dilation; Addition of Velocities; Variation of Mass with Velocity and Mass Energy Equivalence.

UNIT II:
Interference: Introduction; Coherent Sources; Analytical treatment of interference; Young's double slit experiment and its analysis; Conditions of Interference; Fresnel's Biprism; fringes with white light; Determination of wavelength of monochromatic light by using Fresnel's Biprism method; Displacement of Fringes; Interference in plane parallel thin film (reflected and transmitted light) and wedge shaped film(reflected light only); Newton's Rings; Determination of wavelength of monochromatic light and determination of refractive index of a liquid by using Newton's ring method.

UNIT III:
Diffraction: Introduction; Difference between Interference and diffraction; resultant of superposition of n simple harmonic coherent vibrations; Fraunhofer diffraction due to single slit: resultant intensity; conditions of maxima; minima; angular and linear width of central maximum; Double slit diffraction: resultant intensity; missing order; N-slit diffraction : resultant intensity; conditions of maxima and minima; missing orders; angular width of principal maxima; Diffraction grating: formation of spectra and missing order spectra in spectrum; dispersive power of grating; Resolving power; Rayleigh Criterion of resolution; Resolving power of plane transmission diffraction grating.

UNIT IV:
Polarization: Polarised and unpolarised light and its pictorial representation; plane of polarisation and plane of vibration; Phenomenon of Double Refraction; positive and negative double refracting crystals; properties of ordinary and extra-ordinary Rays; Nicol Prism and its application as a polariser and analyser; Mathematical analysis of superposition of two linearly polarised light vectors; retardation plates – half wave plate and quarter wave plate; Production and detection of Plane; Circularly and Elliptically Polarized Light.
Laser: Spontaneous emission; stimulated emission and stimulated absorption; Einstein's A and B Coefficients and relation between them; Principle of Laser Action; Construction and Working of He-Ne; Semiconductor Laser.

UNIT V:
Wave Mechanics : Wave Particle Duality; de Broglie Concept of Matter Waves; Davisson and Germer experiment; Concept of wave packet; group and phase velocity; Heisenberg Uncertainty Principle and its applications viz. non existence of electron in nucleus; radius and energy of Bohr's first orbit; Schrödinger time independent and time dependent wave equation; Physical interpretation of wave function; Application of Schrodinger wave equation: Particle in a one dimensional box (eigen function and eigen values).
Introduction to Fibre Optics: Fundamental ideas about optical fiber; Types of fibers; Acceptance angle and cone; Numerical Aperture.

Text Books:

1. AjoyGhatak**; Optics;** Tata Mc-Graw Hill Education;2009.
2. Subramanyam; BrijLal;**A Text Book of Optics**; S. Chand, 2004.
3. K. Thyagarajan, AjoyGhatak; **Lasers: Fundamentals and Applications**; Second;Springer, 2010.
4. AjoyGhatak& K. Thyagarajan ;**Introduction to Fiber optics;**Cambridge University Press,1998.
5. Halliday, Resnick& Walker; **Principles of Physics**; Nineth, Wiley, India;2013

Reference Books:

1. Arthur Beiser ;**Concepts of Modern Physics**; Tata Mc-Graw Hill Education;2003.
2. Robert Resnick;**Introduction to Special theory of Relativity** ; First; John Wiley& Sons; 1968.
3. Jenkins and White ;**Fundamentals of Optics**; Fourth; McGraw-Hill;2001
4. David. J. Griffith; **An Introduction to Quantum Mechanics**;Second; Pearson prentice Hall; 2004.
5. Young and Freedman;**Sears and Zemansky's University Physics**,Tenth; Addison-Wesley, 2000.

List of Experiments

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help ofFresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locatethe position of cardinal points.
4. To determine the specific rotation of cane sugar solution using bi quartz polarimeter.
5. To determine the wavelength of spectral lines using plane transmissiongrating.
6. To determine the specific resistance of the material of given wire usingCarey Foster's bridge.
7. To determine the variation of magnetic field along the axis of a currentcarrying coil and then to estimate the radius of the coil.
8. To verify Stefan's Law by electrical method.
9. To calibrate the given ammeter using potentiometer.
10. To calibrate the give voltmeter using potentiometer.
11. To determine energy band gap of a given semiconductor material by p-n junction method.
12. To determine the viscosity of water by Poisseuille's method.

Note: Additional experiments may be added based on contents of syllabus.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **Essentials of Mechanical Engineering**	Course Code: **LA1210**
Credit: 4**.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **I**

UNIT – I **9L**

Introduction to Engineering: Difference between Science and Technology, history of wheel, introduction to prime movers, transmission system, belt, pulleys, gear system and nomenclature, braking system, Mechanism, lever mechanism, Working principle of power generation system, hydel power plant, thermal power plant and its main components.

Coplanar Force system: Resolution of force in two mutually perpendicular direction Free Body Diagram, Moment, Varignon's theorem, static equilibrium, Lami'sTheorem, type of joints/Support, Type of load: point load, uniformly constant and varying loads, beam and its type.

UNIT – 2 **7L**

Engineering material and their properties: Details of hook's law, Proportional limit, Yield point, Yield Stress, Engineering strain, Engineering stress, True stress and Strain, Plasticity, Elasticity, Allowable Strength, Hardness, Ductility, toughness, Fatigue, creep, strain energy, Impact Strength, Young modulus of Elasticity, Bulk Modulus, Poission Ration and its relation in between.

Stress and strain: Normal stress and strain, principle of Superposition, Deformation in stepped and composite bar.

UNIT – 3 **7L**

Thermodynamics: Macroscopic & microscopic study point of view, System, Surrounding and Universe, Phase, Property, State, Path, Process, Cyclic and non-cyclic processes, Quasi static process, Reversible and irreversible processes , Thermodynamic equilibrium, Concept of continuum, Energy and its forms, Enthalpy, Zeroth law, Different temperature scales and theory of temperature and Pressure measurement.

UNIT – 4 **8L**

Laws of Thermodynamics: Thermodynamic definition of work, Thermodynamic processes, Calculation of work in various processes and sign convention, Non-flow work and flow work, Joules' experiment, First law of thermodynamics, Internal energy and enthalpy, First law of thermodynamics applied to open systems, Steady flow energy equation and its applications, First law analysis for closed system (non flow processes), Limitations of first law of thermodynamics, PMM-I.

Statement of Second Law of Thermodynamics: Kelvin Planck's statement and Clausius statement and their equivalence.

UNIT – 5 **9L**

Power generation: Air standard cycle**,** IC Engine**,** Carnot cycle, Otto cycle, Diesel cycle, Important components of I.C.Engine, two stroke and four stoke engine, S.I. and C.I. engines, efficiency of Otto and diesel cycle

Basics of Heat Transfer: Concepts of the mechanisms of heat flows: conduction, convection and Radiation heat transfer application in engineering.

Reference Books:

1. Basu,A.R; A Text book of Engineering Mechanics(Applied Mechanics);2003 Edition; Dhanpat Rai & co.(p) Ltd, Delhi.
2. Chandramouli, P.N; Engineering Mechanics; Second Printing; PHI Learning Private Limited, Delhi; 2013.
3. Rajput, R. K; Material Science; S. K. Kataria & Sons, New Delhi.
4. Dubey, N. H; Engineering Mechanics, Statics and Dynamics; First reprint; McGraw Hill Education (India) Private Limited, New Delhi, 2013.
5. Ratan, S.S; Theory of machines; Second Edition; Tata McGraw Hill Publishing Company Limited, New Delhi.
6. Nag.P.K.; Engineering Thermodynamics; 3rd Edition; Tata McGraw Hill Publishing Company Limited, New Delhi.
7. Nag.P.K.; Heat and Mass Transfer; Tata McGraw Hill Publishing Company Limited, New Delhi.
8. Kumar.D.S; Basic of Mechanical Engineering; S. K. Kataria & Sons, New Delhi.

Essentials of Mechanical Engineering Lab

List of Experiments

1. Tensile test
2. Impact test
3. Hardness test
4. Pulley experiment
5. Experiment on conduction heat transfer
6. Demonstration of Impulse and reaction turbine
7. Study of 4s and 2S engine petrol Engine
8. Study of 4s and 2S engine Diesel Engine
9. Study of refrigerator and air conditioning

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **Professional Communication – I**	Course Code: **HA1210**
Credit: **3.5**	L T P **3 1 0**
Year: **1st**	Semester: **I**

UNIT 1: **COMMUNICATION** **(6 Hrs)**

1. Communication: Definition and Process of Communication.
2. Types of Communication: Formal and Informal Communication, Verbal and Non-Verbal Communication.
3. Barriers to Communication: Intrapersonal and Interpersonal Barriers. Semantic Barriers, Physical Barriers, Psychological Barriers, and Organizational Barriers.

UNIT 2: **LISTENING SKILLS & SPEAKING SKILLS** **(8 Hrs)**

1. Importance and Objective of Listening Skills, Process of Listening, Listening and Hearing, Types of Listening, and Methods for Improving Listening Skills
2. Listening Comprehension: Identifying General and Specific Information.
3. Listening for Note taking and drawing Inferences.
4. Importance of Speaking Skills, Types of Speaking, Methods for Improving Speaking Skills
5. Introduction to Phonetic Transcription: Familiarization with British and American Usage.

UNIT 3: **READING SKILLS** **(4 Hrs)**

1. Importance of Reading Skills, Types of Reading Skills, Methods of Improving Reading Skills.
2. Vocabulary Building: Antonyms, Synonyms, Homophones, Homonyms, and One-Word Substitution, Etymology and roots.

UNIT 4: **WRITING SKILLS** **(10 Hrs)**

1. Importance of Writing Skills, Types of Writing Skills, and Methods for Improving Writing Skills.
2. Sentence and Paragraph Construction. Writing Expository, Argumentative and Deductive Order etc Paragraphs.
3. Précis Writing
4. Basic Letter Writing: Format and Style of Formal Letters.

UNIT 5: **ONE ACT PLAY** **(6 Hrs)**

Practice of LRSW through the study of the one act play, ***THE REFUND*** by **Fritz Karinthy**.

TEXT BOOK

1. Gupta, Ruby. Basic Technical Communication, Cambridge University Press, New Delhi.2012.

REFERENCE BOOKS

1. Rizvi, Ashraf. Effective Technical Communication, McGraw Hill, New Delhi. 2005
2. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011
3. Tyagi, Kavita& Padma Misra. Basic Technical Communication, PHI, New Delhi. 2011
4. Lewis, Norman. Word Power Made Easy, W.R Goyal Pub. & Distributors.1995
5. Ford A, Ruther. Basic Communication Skills; Pearson Education, New Delhi.2013
6. Aslam, Mohammad. Introduction of English Phonetics and Phonology Cambridge.2003
7. Kameswari, Y. Successful Career Soft Skills and Business English, BS Publications, Hyderabad.2010
8. English Pronouncing Dictionary, Cambridge.2012
9. The Oxford Guide to Writing and Speaking. OUP, Delhi.2011

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20
Professional Communication – I Lab

Lab 1	Neutralization of Mother Tongue Influence through manner of articulation
Lab 2	Common Errors in English and Indianisms.
Lab 3	Introduction to Speech Sounds – Practicing Vowel and Consonant sounds
Lab 4	Syllable, word stress, Sentence stress
Lab 5	Pause group, Intonation & Rhythm
Lab 6	Functional English
Lab 7 & 8	Everyday Conversation : Greetings, Apologies, Requests, At a Restaurant, Shopping, Groceries, Hiring an Apartment, Travel Courses, etc.
Lab 9	Developing Listening skills through cultural movies
Lab 10 &11	Movie - To provide exposure to the target language
Lab 12	Final evaluation based on Extempore

References: (Software and Videos)

1. Wordsworth English Language laboratory software
2. Wordsworth Prep 1-2-3
3. Connected Speech Level 1-2-3
4. Learn To speak English CD 1-2-3-

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **Computer Fundamentals and 'C' Programming**			Course Code: **DA1210**
Credit: **4**	L **3**	T **0**	P **2**
Year: **1st**			Semester: **I**

UNIT 1 **(8 L)**

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system: Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

UNIT 2 **(8 L)**

Standard I/O in C, Fundamental data types- Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external**,** Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Fundamentals of C programming: Structure of C program**,** writing and executing the first C program, components of C language. Standard I/O

UNIT 3 **(8 L)**

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch**,** program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break, continue and goto statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

UNIT 4 **(8 L)**

Arrays: Array notation and representation, manipulating array elements using one and two dimensional arrays, linear searching, sorting (bubble sort), strings, matrix manipulation (transpose, addition, multiplication).

Structures: Purpose and uses of structures, declaring structures, array of structures, union, enumerated data types

UNIT 5 **(8 L)**

Pointers: Pointers: pointer variables, pointer operator, pointer expression, array of pointers, multiple indirection, pointers to functions, dynamic memory allocation functions.

File handling**,** standard C preprocessors**,** defining and calling macros, conditional compilation.

Text Books:

1. YashwantKanetkar, "Let us C", BPB Publications, 2nd Edition, 2001.
2. Herbert Schildt, "C:The complete reference", OsbourneMcgraw Hill, 4th Edition, 2002.
3. Computer Fundamentals and Programming in C. ReemaThareja, Oxford Publication
4. P.K. Sinha "Computer Fundamentals" B.P.B Publication.

Reference Books:

1. Raja Raman, "Computer Programming in C", Prentice Hall of India, 1995.
2. Kernighan & Ritchie, "C Programming Language", The (Ansi C Version), PHI, 2nd Edition.
3. Byron Gottfreid "Schaum's Outline of Programming with C".

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20
List of Programs in 'C' Lab

Lab 1	(a) WAP to perform simple arithmetic operations using different data types. (b) WAP to show swap of two no's without using third variable.
Lab 2	(a) WAP to find the roots of a quadratic equation. (b) WAP to check the number is odd or even and find the sum of all odd and all even separately.
Lab 3	(a) WAP to find out whether the given number is prime or not. Find sum of all prime upto N. (b) WAP to reverse a given number and check the palindrome status.
Lab 4	WAP to print corresponding days of a week using switch case.
Lab 5	WAP to find and generate the Armstrong number.
Lab 6	WAP to print pattern triangle like Floyd's, Pascal, pyramid triangle.
Lab 7	(a) WAP to interchange two values using call by value and call by reference. (b) WAP to print factorial of a number using recursion & without using recursion.
Lab 8	WAP to print Fibonacci series. (**a**) Without using function (**b)** using function (**c)** using recursion
Lab 9	(a) WAP to print an array and find greatest/smallest element of an array. (b) WAP to perform linear searching in an array.
Lab 10	(a) WAP to insert/ delete element from an array. (b) WAP to sort the array's element using Bubble sort.
Lab 11	WAP to perform the following string functions. **a.** Strlen **b**. strcmp **c.**strcpy **d**. strcat **e**. strlwr **f**.strupr
Lab 12	Declare a suitable structure of a college and print the name and DOB of the student have scored more than sixty percent marks in end semester exam.
Lab 13	Declare a suitable structure for an organization and print all the names of employees having salary more than Rs.1000.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **Environmental Science**	Course Code: **BA1010**
Credit: **2**	L **2** T **0** P **0**
Year: **1st**	Semester: **I**

Unit – 1 **(6L)**

Natural Resources: Renewable and non-renewable resources

Definition, scope, importance and need for public awareness, natural resources and associated problems.

- Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
- Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
- Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture and green revolution, water logging, salinity.
- Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources.
- Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Unit – 2 **(5L)**

Ecosystems

Concept, Structure and function of an ecosystem, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the Forest and aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit – 3 **(5L)**

Biodiversity and its conservation

Introduction – Definition: genetic, species and ecosystem diversity. Bio geographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-sports of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit – 4 **(6L)**

Environmental Pollution

Definition, Cause, effects and control measures of:-

a. Air pollution b. Water pollution c. Soil pollution
d. Marine pollution e. Noise pollution f. Thermal pollution
g. Nuclear hazards

• Solid waste Management and biomedical waste: Causes, effects and control
• Role of an individual in prevention of pollution.
• Pollution effects-global warming, acid rain, ozone depletion, smog and case studies.
• Disaster management: floods, earthquake, cyclone and landslides.

Unit – 5 **(6L)**

Social Issues and the Environment

- From Unsustainable to Sustainable development
- Water conservation, rain water harvesting, watershed management
- Environmental Impact Assessment and Resettlement and rehabilitation problems.
- Climate change
- Wetland conservation.
- Role of remote sensing and GIS in environmental monitoring and analysis
- Environment Protection Act. 1986
- Air (Prevention and Control of Pollution) Act. 1981
- Water (Prevention and control of Pollution) Act 1974
- Wildlife Protection Act 1972
- Forest Conservation Act 1980.

Field work:

- Visit to a local area to document environmental assets river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

REFERENCE BOOKS:

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad –380 013, India, Email:mapin@icenet.net (R)
2. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
3. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
4. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
5. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
6. Gleick, H.P. 1993. Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
7. Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
8. Mckinney, M.L. & School, R.M. 1996. Environmental Science Systems & Solutions, Web enhanced edition. 639p.
9. AnubhaKaushik&Kaushik, C.P. 2009.Perspectives in Environmental Studies, New Age International Publishers.
10. Manahan. S.E., Environmental chemistry, 9th edition.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **Engineering Graphics**	Course Code: **LA1220**
Credit: 2	L **1** T **0** P **2**
Year: **1st**	Semester: **I**

UNIT – 1
Introduction: Sheet Layout, Types of Sheet, Size of Sheets, Title blocks, Type of lines, Lettering, Dimensioning, Scale (Full, Reduced, Large) Geometrical Constructions,

UNIT – 2
Projection: Methods of Projection, Planes of Projection, Projection of points, Projection of straight lines, Projection of auxiliary planes, Projection of planes.

UNIT – 3
Projection of solids, Sections of solids.

UNIT – 4
Development of surfaces

UNIT – 5
Isometric Projections

Reference Books:
1) Bhatt N. D. & Panchal V. M, "Engineering Drawing", Charotar Publisher, 2007.
2) Dhanjay A Jolhe, "Engineering Drawing" Tata McGraw Hill, 2008.
3) Gill P.S "Engineering Graphics" S. K. Kataria & Sons, 2009
4) John K.C, "Engineering Graphics" , 2nd edition, PHI Learning Pvt. Ltd., 2010

List of Experiments

1. Introduction to AutoCAD Commands, Explaining need of AUTO CAD over Manual drafting, Simple Drawings.
2. Sheet on Lettering and Geometric construction.
3. Orthographic Projections, Basic problem based on Projection of points.
4. Sheet on Projection of Lines.
5. Sheet on Projection of Planes.
6. Sheet on Projection of Auxiliary Planes.
7. Sheet on Projection of Solids.
8. Development of Surfaces.
9. Sheet on Isometric Projections from orthogonal views.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **Engineering Mathematics – II**	Course Code: **JA2010**
Credit: **3.5**	L **3** T **1** P **0**
Year: **1st**	Semester: **II**

UNIT I: **(10L)**

Linear Algebra

Matrices; Inverse of matrix; Echelon form; Rank of matrix; Consistency and solution of a system of linear equations; Linear dependence and independence of vectors; Matrix transformations; Eigen values and eigenvectors; Cayley– Hamilton theorem; Reduction to diagonal form; Vector spaces; Sub spaces; Basis; Dimension; Linear Transformation**.**

UNIT II: **(8L)**

Differential Equations

Linear differential equations first order and first degree; Linear differential Equations of higher orders with constant coefficients; Complementary functions and Particular integrals; Euler-Cauchy linear differential equations; Simultaneous linear differential equations; Method of variation of parameters.

UNIT III: **(6L)**

Infinite Series

Introduction; Sequences; Series; Convergence; Series of positive terms; Comparison test; Integral test; D'Alembert's Ratio test; Cauchy's root test; Alternating series; Leibnitz rule.

UNIT IV: **(8L)**

Fourier Series

Periodic functions; Fourier series of Periodic functions; Euler's formulae; Functions having arbitrary period; Change of intervals; Even and Odd functions; Half range sine and cosine series.

UNIT V: **(8L)**

Laplace Transform

Laplace Transform; Existence theorem; Properties of Laplace Transform ; Laplace Transform of derivatives and integrals; Laplace Transform of Periodic functions; Unit Step function and Error Function; Dirac- Delta function; Unit impulse function; Convolution theorem; Applications of Laplace Transform to solve linear and simultaneous differential equations.

Text Books:

1. R. K. Jain & S. R. K. Iyenger, **Advanced Engineering Mathematics**, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.
2. E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, John Wiley & Sons, U.K., 2006.

Reference Books:

1. W. E. Boyce and R. Di Prima, **Elementary Differential Equations**, (8th Edition), John Wiley & Sons, U.K., (2005).
2. B. S. Grewal, **Higher Engineering Mathematics**, 42nd Edition, Khanna Publication, New Delhi, India, 2012.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **Engineering Chemistry**	Course Code: **BA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **II**

UNIT – I

Water Chemistry

Introduction, Analysis of Water – Alkalinity, Chlorides and Dissolved Oxygen, Hardness of Water - Temporary and Permanent hardness, Estimation of hardness by EDTA Method, Disadvantages of Hard Water, Numerical problems.

Water for Industrial purpose – Boiler Feed Water, Boiler Troubles (Priming and Foaming, Boiler Corrosion, Scales and Sludges, Caustic Embrittlement), Water Treatment: Internal Treatment (Colloidal, Phosphate, Calgon, Carbonate Conditioning), External Treatment (Lime-Soda Process, Zeolite Process, Ion- Exchange Process), Numerical Problems.

UNIT – II

Physical Chemistry

Electrochemistry: Reference electrodes, Ion selective electrodes, Chemically modified electrodes as sensors, Electrochemical energy systems, Lithium batteries, Fuel cells.

Thermochemistry: Hess's Law, Heat of a reaction, Effect of temperature on heat of reaction at constant pressure (Kirchoff's eq.), Heat of dilution, Heat of hydration, Heat of neutralization and Heat of combustion.

Surface chemistry: Surface and interfacial tension, Capillary pressure.Adsorption phenonmenon, Adsorption of gaseson solids, Frendlich and Langmuir adsorption isotherms,Role of adsorbents in catalysis, ion-exchange and pollution abatement.

UNIT – III

Science of Corrosion and Protective Coatings

Introduction, Types of Corrosion, Theories of Corrosion and Mechanism, Factors Influencing Corrosion.Control of Corrosion.

Types of Protective Coatings: Metallic Coatings, Anodic Coatings, Galvanization, Cathodic Coatings, Tinning, Metal Cladding, Electroplating (Chromium Plating, Metal Spraying, Cementation-Sheradizing, Colourizing, Chromizing).

UNIT – IV

Introduction to Polymers and Nano-materials

Polymerization, Classification of polymers, Addition and Condensation Polymerizations. Plastics - Thermosetting and Thermoplastics. Preparation, Properties and Uses of Polyethylene, PVC, Teflon, Bakelite, Nylon, Polyester, Polyurethane, Ziegler-Natta catalyst, conducting polymers.Rubber- Processing of Natural Rubber, Vulcanization and Compounding. Elastomers: Buna-S, Buna- N, Thiokol.

Introduction to Nano-materials: Fullerenes, Nano-tubes, Nano-wires, Nano-cones, Nano-dots, Nano-sphere, Haeckelites. Their electronic and mechanical properties, Production methods for CNTs. Applications of nano materials in i) Medicine ii) Catalysis iii) Environmental Technologies iv) Electronics& related fields. v) Mechanics.

UNIT – V

Fuels & Lubricants

Fuels: Classification, crude oil: composition and fractionation, Octane & Cetane Number and their significance; calorific value of fuel, Determination of calorific value of fuels, bomb calorimeter, Solid fuels - Proximate and ultimate analysis, Numericals problems.

Lubricants: Functions of lubricants, Mechanism of Lubrication (thick film or hydrodynamic lubrication, thin film or boundary lubrication, extreme pressure lubrication), Classification and properties of lubricants- Viscosity, Flash and fire point, Cloud and pour point, Aniline point, Neutralization number and mechanical strength. Numerical problems on acid value and saponification value.

Text Books:

1. Chemistry in Engineering & Technology (Vol I & II) (Latest ed.) By J.C. Kuriacose& J. Rajaraman, Tata McGraw-Hill Co, New Delhi.
2. Engineering Chemistry by O.G. Palanna, Tata McGraw-Hill Co, New Delhi.

Reference Books:

1. Atkins' Physical Chemistry by Peter W. Atkins and Julio de Paula, Oxford University Press.
2. Principles of Physical Chemistry (Latest ed.) By Puri, Sharma & Pathania.
3. Organic chemistry, Morrison and Boyd, Pearson Prentice Hall, 2011
4. Environmental chemistry, S.E. Manahan, 9th edition, CRC Press.
5. Textbook of polymer science by F.W. Billmeyer, Wiley India.

Engineering Chemistry Lab

List of Experiments

1. Estimation of hardness of water by EDTA method
2. Estimation of total alkalinity in the given water sample.
3. Estimation of dissolved oxygen in the given water sample.
4. Estimation of available chlorine in the given sample of bleaching powder.
5. pH-metric titration.
6. Determination of viscosity of lubricants by Redwood viscometer / Ostwald's viscometer.
7. Determination Surface Tension of lubricants.
8. Determination of Flash point of a given oil by Pensky_Marten's flash point approach.
9. To Determine Saponification-value of the given Lubricating Oil.
10. To Determine Acid-Value of the given Lubricating Oil.
11. To determine the moisture, volatile and ash contents in a given coal sample by proximate analysis.
12. To study the adsorption of acetic acid on activated charcoal.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **Introduction to Electrical Engineering**	Course Code: **EA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **II**

UNIT – 1
D.C. NETWORK THEORY
Review of basic circuit theory concepts, Mesh and Nodal analysis, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Star–delta transformation, Magnetic Circuits.

UNIT – 2
A.C. CIRCUITS & MEASURING INSTRUMENTS
*Single Phase A.C.:*Phasor representation of voltage and current, A.C. circuit behavior of resistance, inductance, capacitance & their combination in series and parallel, Power triangle, Power factor, Concept of series & parallel resonance.
*Three Phase A.C.:*Star – delta connections, Relation between line and phase quantities, three phase power and its measurement, What is 3 phase 4 wire and 3 phase 5 wire system?
Measuring Instruments: Construction and principle of voltage and current measuring instruments.

UNIT – 3
TRANSFORMERS
Principle of operation, Types of construction, Phasor diagram, Equivalent circuit, Efficiency and voltage regulation of single phase transformer, O.C. and S.C. tests.

UNIT – 4
D.C. & SYNCHRONOUS MACHINES
D.C. Machines: Construction and working principle of d.c. generator and d.c. motor, Types of d.c. machines, E.M.F. equation, Torque equation, Magnetization and load characteristics, Losses and efficiency, Need of starter in d.c. motors.
Synchronous Machines: Construction and Principle of operation of Alternator and Synchronous Motor.

UNIT – 5
INDUCTION MOTORS
Three Phase Induction Motors: Principle of operation of 3-Ø induction motor, Types of 3-Ø induction motor, Need of starters in 3-Ø induction motors, Slip – torque characteristics,
Single Phase Induction Motor: Principle of operation of single phase induction motor, Methods of starting of single phase induction motor.

Reference Books:
1. V. Del Toro. " Principles of electrical Engineering, "Prentice hall International.
2. W.H. Hayt& J.E. Kemmerly," Engineering circuit Analysis, "McGraw Hill.
3. I. J. Nagrath, "Basic Electrical Engineering," Tata Mc. Graw Hill.
4. A. E. Fitgerald, D.E., Higginbotham and A Grabel, "Basic Electrical Engineering" McGraw Hill
5. H. Cotton, "Advanced Electrical Technology" Wheeler Publishing.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20
Basic Electrical Engineering Lab

(Any Ten)

1. Verification of Network Theorems.
2. Study of diode characteristics. Study of phenomenon of resonance in RLC series circuit.
3. Measurement of power in a three phase circuit by two wattmeter method.
4. Measurement of efficiency of a single phase transformer by load test.
5. Determination of parameters and losses in a single phase transformer by OC and SC test.
6. Study of characteristic of DC Motor.
7. Study of characteristic of AC Motor.
8. DC generator characteristics.
9. 10. Speed control of dc shunt motor.
10. Study running and reversing of a three phase induction motor.
11. Study of a single phase energy meter.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **Introduction to Electronics & Communication**	Course Code: **FA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **II**

UNIT 1: Fundamental of Semiconductors ***10 L***

Energy bands in semiconductors, intrinsic and extrinsic semiconductors, Fermi Level in Intrinsic and Extrinsic semiconductor, Carrier transport in semiconductors: diffusion current, drift current, mobility, Hall Effect and resistivity. Generation and recombination of carriers.

UNIT 2: Application of Low Power and High Power Diodes ***10 L***

Diode circuits: Construction, Junction diode characteristics, Half and full wave rectifiers - Expression for efficiency and ripple factor - Bridge rectifier – π Filter circuits, Clipper, Clamper and multipliers using diodes, Zener Diode Characteristics - Regulated power supply using Zener diode.

UNIT 3: Transistor fundamentals ***8 L***

Transistor circuits: Characteristics of a transistor in CB, CE and CC modes - Relatively merits - Biasing of Transistors - Load Line and operating point concept (both AC and DC). Construction and working of JFET and MOSFET.

UNIT 4: Digital fundamentals and Introduction to Signals ***8 L***

Basic logic gates: AND, OR, and NOT – implementation of all gates using Universal gates, Number Systems conversions, Boolean algebra, K-map (upto 4 variables). Source of Information, Types of Signals.

UNIT 5: Basics of Communications & Instrumentation ***9 L***

*C*ommunication Systems, Communication Channels, Need of modulation, Types of modulations (Wave shapes and final expression only), Study of Piezoelectric, PMMC, LVDT and Strain Gauge transducers and their classifications and display device (7 segment) only.

Reference Books:

Unit 1. Electronics Devices and Circuits, Millman and Halkias, Tata McGraw Hill, 4th ed.
Unit 2 & 3. Electronic Devices and Circuit Theory, Robert L. Boylestad, Prentice Hall Higher Edu., 2000.
Unit 4. Digital Design, Morris Mano, PHI
Unit 4. Modern Digital & Analog Communications, B. P. Lathi, OUP
Unit 5. Electronic Communication Systems, John Kennedy , Tata McGraw Hill, 4th ed.
Unit 5. Electronic Instrumentation - H. S. Kalsi

ELECTRONICS ENGINEERING LAB.

1. To identify and Study of the various component and Devices of electronics with their specification (CRO, Function Generator, Multimeter, Power Supply, resistor, capacitor, inductor, ICs, LED, potentiometer etc.)
2. To study the V-I characteristics of PN diode and Zener diode.
3. To find the efficiency of Rectifiers and ripple factor of capacitive and non-capacitive half wave and full wave rectifier.
4. To Study and Verify clipper and clamper with biased circuits.
5. To find the characteristics of CB and CE amplifiers.
6. Determine the characteristics of FET.
7. To find out the power energy of various periodic and non periodic signals.
8. To verify the logic gates using diodes.
9. Study and observations of AM & FM Waveforms.
10. Study of various transducers (Strain Gauge).

****** Plus 2-3 value added experiments can be performed.*

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **Professional Communication – II**	Course Code: **HA2210**
Credit: **3.5**	L **3** T **0** P **1**
Year: **1st**	Semester: **II**

UNIT 1: **PROFESSIONAL COMMUNICATION** **(6 Hrs)**

1. Importance and Features of Business Communication, Flow and Channels of Communication in an Organization.
2. Introduction to Technical Communication, Types and History of Technical Communication.
3. Difference between General and Technical Communication, and Importance of Technical Communication.
4. Characteristic of Technical Communication, and Elements of Style.
5. Process of Preparing a Technical Document.
6. Elements and Features of Scientific Articles.
7. Compunication, E- mail, E- tools and Encyclopedia.

UNIT 2: **BUSINESS CORRESPONDENCE** **(8 Hrs)**

1. Business Correspondence – Principles, Features, Types, Format and Layout of Business Letter.
2. Inter Office Correspondence – Letters of Enquiry, Quotation, Order, Sales, and Complaint.
3. Intra Office Correspondence: Notice, Agenda, Minutes, and Memorandum.
4. Job Application Letter.

UNIT 3: **TECHNICAL PROPOSAL and TECHNICAL REPORT** **(8 Hrs)**

1. Technical Proposal - Introduction, Purpose, Features, Types, Format, Importance, and Writing Technical Proposals and Plagiarism.
2. Technical Report - Features, Types, Style, Format, Relevance, and Writing Technical Reports.

UNIT 4: CORPORATE COMMUNICATION SKILLS **(8 Hrs)**

1. Dimensions and importance of EQ
2. Interpersonal communication skills - Life Position, and Transactional Analysis
3. Johari Window: Role of Feedback and Disclosure in Communication; Accepting Criticism
4. Cross Cultural Communication
5. Attitude
6. Perception
7. Personality Attributes and Communication: Self Esteem, Self-Monitoring, Impression Management, and Locus of Control.
8. Conflict and Negotiation

UNIT 5: PROJECT **(6 Hrs)**

REPORT WRITING/ PROPOSAL WRITING

The students will write a Report **OR** a Proposal consisting of 10-15 pages.

REPORT WRITING

1. **For B.Tech. students**-
    a. Technical Report describing new machinery, a report on the sudden break down in production unit, and market survey report for formulating new market strategy.
2. **For B.Pharma. students**
    a. Technical Report based on the site inspection of a drug manufacturing unit, Survey Report on Health Awareness and Self-Medication.

3. **For B.Arch. students**
    a. Technical Reports based on a Site Inspection for Geographical and Geological aspects of a particular location, A Report on the Architectural Survey of a Monument. Architectural

PROPOSAL WRITING

1. **For B.Tech. students**
    a. Technical Proposal to organize a Technical Training Program, To develop new range of a product and to start a new venture.
2. **For B.Pharma. students**
    a. Technical proposal to establish a new laboratory, To create new drug-composition and to visit to a Super Specialty Hospital.
3. **For B.Arch. students**
    a. Technical Proposal for an Archeological Site visit , To Construct New Buildings.

Report Writing and Proposal Writing carries 30 marks equivalent to three class tests.

TEXT BOOK

1. Gupta, Ruby. Advanced Technical Communication, Cambridge University Press, New Delhi. 2011.

SUGGESTED REFERENCE BOOKS

1. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011.
2. Tyagi, Kavita& Padma Misra. Advance Technical Communication, PHI, New Delhi.2011
3. Technical Communication, Cengage Learning, New Delhi.2010
4. Technical Communication, OUP, New Delhi. 2013
5. Wallace, Masters Personality Development, Cengage Learning, New Delhi.2006
6. Barrass, Robert: Students Must Write, Foundation books, Cambridge, New Delhi.2006
7. Rao, Bhaskar: Successful Career Soft Skills and Business English, BS Publications, Hyderabad.2012
8. Chakrawarthi: Soft Skills for Professionals, Wiley India.2011

Professional Communication – II Lab

Lab 1	Vocabulary Building
Lab 2	Telephone Etiquette: Making an appointment , answering Calls
Lab 3	Public Speaking
Lab 4	Group Discussion: Do's and Don'ts of GD
Lab 5 & 6	Interview Skills: Preparation
Lab 7	PP Presentation Skills: Techniques of making effective presentation
Lab 8	Meeting : Conducting meetings effectively
Lab 9	Developing Negotiating skills
Lab 10 &11	Reading Comprehension
Lab 12	Evaluation

References: (Software and Videos)

1. Wordsworth English Language laboratory software
2. Wordsworth Prep 1-2-3
3. Communicate
4. Train 2 Success
5. Additional PPTs

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **Computer Programming in C++**			Course Code: **DA2210**
Credit: **4**	L **3**	T **0**	P **2**
Year: **1st**			Semester: **II**

Unit -1 **8L**

Introduction to Object Oriented Programming, including methodologies, programming techniques, Object Oriented languages.
Overview of C++ basic structures, including the main () function, C++ data types, different type of operators expressions and statements, standard Input/output, Simple flow of control, Defining user defined Functions.

Unit -2 **8L**

General overview of objects and classes, Object and classes in C++, including class definition, Defining members inside or outside, accessing of members, constructors, types of constructors, destructors and Pointer to class object.

Unit-3 **8L**

Polymorphism: function overloading, methods of overloading, constructor overloading, Operator overloading.
General overview of inheritance: Introduction, Categories of inheritance, public/protected/private inheritance, constructors and destructors in derived classes, and Virtual Base class.

Unit-4 **8L**

Function overriding and virtual functions, Abstract class and abstract base class, Friend functions, Templates in C++, function templates, class templates, templates and inheritances, templates and static members.

Unit-5 **8L**

File handing in C++: opening of file, closing of file, text files, binary files, Reading and writing into a file. Exception Handling in C++, including usage, try, throw and catch.

Text Books:

1. Kip R. Irvine, C++ and Object-Oriented Programming, Prentice Hall, 1997
2. R. Lafore, "Object Oriented Programming using C++", BPB Publications, 2004
3. E Balagurusamy "Object Oriented Programming with C++" T.M.H 2nd edition

Reference Books:

1. Schildt Herbert, "C++ Programming", 2nd Edition, Wiley DreamTech.
2. YashwantKanethkar, "Object Oriented Programming using C++",BPB, 2004

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20
List of Programs in 'C++' Lab

Lab 1	(a) WAP to print first 10 prime numbers. (b) WAP to demonstrate nested loops. (c) WAP to print reverse of a given number. (d) WAP to read two numbers from keyboard and display the larger one.
Lab 2	(a) Create a class called Employee that includes three pieces of information as instance Variables – a first name (type String), a last name (type String) and a monthly salary (Double) (b) Create a constructor in above class to initialize the three instance variables. Provide a get method for each instance variable. (c) WAP to demonstrate destructors.
Lab 3	(a) Program to implement different types of inheritances like Multiple, Multilevel and hybrid. (b) Write a program in C++ demonstrating the public, protected and private parameters. (c) Write a program in C++ to demonstrate destructor in inheritance. (d) WAP to demonstrate encapsulation property of OOPs.
Lab 4	(a) Write a program that uses a class where the member functions are defined inside a class. (b) WAP that uses a class where member functions are defined outside a class. (c) WAP that uses a class where member functions are defined inside a class. (d) WAP to demonstrate the use of Static Data members.
Lab 5	(a) WAP to demonstrate the use of Dynamic Constructor. (b) WAP to demonstrate the use of function Template. (c) Illustrate and implement the C++ program to initiate the base constructor from derived class constructor.
Lab 6	(a) Write a C++ program to find the largest and smallest element of an array.
	(b) Create a class Matrix. Implement all possible matrix operations for Matrix type objects by overloading them.
Lab 7	(a) Create 2 classes OM and DB which store the value of distance. DM store distances in meters and cm and DB in feet and inches. Write a program that can read values for the class objects and add 1 object OM with another object of DB.
	(b) Define a class to represent bank account. Include the following members: **Data members** 1. Name of depositor. 2. Account number. 3. Type of account. 4. Balance amount in the account. **Member functions** 1. To assign initial values. 2. To deposit an amount. 3. To withdraw an amount after checking the balance. 4. To display name and balance. Write a main program to test the program.
Lab 8	(a) WAP to demonstrate static class data. (b) WAP to demonstrate the use of Public, Private and protected classes.
Lab 9	(a) WAP to illustrate the concept of call by reference. (b) WAP to illustrate the concept of unary operator overloading. (c) WAP to illustrate the concept of binary operator overloading.
Lab 10	(a) WAP to demonstrate the use of function overloading. (b) WAP using multiple inheritance for collecting employee details.
Lab 11	(a) WAP using function template to find maximum of two Data. (b) WAP to calculate factorial of given number using copy constructor.
Lab 12	(a) WAP to sort five float and integer numbers using template function (use bubble sort). (b) Demonstrate the use of different types of polymorphism.
Lab 13	(a) Write a function to read a matrix of size M × N from keyboard. (b) WAP to implement aggregation concept.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **Workshop Practice**			Course Code: **LA1110**
Credit: **1**	L **0**	T **0**	P **2**
Year: **1st**			Semester: **II**

List of Experiments

1. Carpentry: To make a T-Lap joint with soft wood.
2. Arc Welding: To make a Lap joint with mild steel flat by arc welding process.
3. Gas Welding: To make a Lap joint of M.S. sheet with gas welding process.
4. Fitting: To make a plug and socket joint with M.S. flat.
5. Machine Shop: To turn a M.S. rod on lathe to prepare a turning specimen.
6. Sheet Metal: To make a square tray with G.I. sheet.
7. Study of Foundry and Forging tools and equipments

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **DATA STRUCTURES**	Course Code: **DA3210**
Credit: **4**	L **3** T **0** P **2**
Year: **2nd**	Semester: **III**

Unit I : **Introduction:** Concept of data structure, Types of data structures, Character String in C, Recursion, Structure, Pointer, Dynamic Allocation, Algorithms, Algorithm analysis, Complexity of algorithms and Time space trade-off.

Arrays: Introduction, Single and multi-Dimensional Arrays, address calculation, application of arrays, Operations defined: traversal, insertion and deletion.

Stacks: Stacks, Array representation of stack, Applications of stacks, Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack.

Unit II : **Queue:** Queue, Array representation and implementation of queues, Circular queues, Operations on Queue: Create Add, Delete, and Full and Empty, De-Queue, Priority queues, Applications of Queues.

Linked Lists: Concept of linked list, Representation and implementation of singly linked list, Circular linked list, doubly linked list, Operations on Linked lists, Concepts of header linked lists, applications of linked lists.

Unit III : **Trees:** Basic terminologies of trees, Binary tree, Complete Binary tree, Extended Binary tree, Representation of Binary tree, Binary tree traversal, Operations on Binary tree.

Binary Search Tree: Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, B-trees.

Unit IV : **Graphs:** Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Representations of Graphs, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.

Unit V : **Searching** & **Hashing:** linear search, binary search, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.

Sorting: Bubble sort, Insertion sort, Selection sort, Quick sort, Merge sort, Heap Sort.

File Handling: Introduction to file handling, Data and Information, File concepts, File organization, files and streams, working with files.

Text Book:

1. Lipschutz, "Data Structures" Schaum's Outline Series, TMH.
2. A. M. Tenenbaum, Langsam, Moshe J. Augentem, Data Structures using C PHI Pub.

Reference Book:

1. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication.
2. Robert Kruse, Data Structures and Program Design in C PHI.
3. Willam J. Collins, Data Structure and the Standard Template library –2003, T.M.H.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES**	Course Code: **DA3220**
Credit: **4**	L **3** T **0** P **2**
Year: **2nd**	Semester: **III**

Unit I : **Introduction:** Numbers and their accuracy, Computer Arithmetic, Errors and their Computation, General error formula, Error in a series approximation.

Solution of Algebraic and Transcendental Equation: Bisection Method, Iteration method, Method of false position, Secant method, Newton-Raphson method, Rate of convergence of Iterative, Newton Raphsion methods.

Unit II : **Interpolation:** Finite Differences, Difference tables Polynomial Interpolation**:** Newton's forward and backward formula Central Difference Formulae: Gauss forward and backward formula, Stirling's, Bessel's, Everett's formula. Interpolation with unequal intervals: Langrange's Interpolation, Newton Divided difference Formula.

Unit III : **Statistical Computation:** Frequency chart, Curve fitting by method of least squares, fitting of straight lines, polynomials, exponential curves, Regression Analysis, Linear and Non linear Regression, Multiple regression.

Unit IV : **Numerical Integration and Differentiation:** Introduction, Numerical differentiation Numerical Integration: Trapezoidal rule, Simpson's 1/3 and 3/8 rule, Boole's rule.

Unit V: **Solution of differential Equations:** Picards Method, Eulers Method, Taylors Method, Runge-Kutta Methods, Automatic Error Monitoring and Stability of solution.

Text Book:

1. Pradip Niyogi, "Numerical Analysis and Algorithms", TMH, 1st Edition.
2. Gerald & Whealey, "Applied Numerical Analysis", AW

Reference Book:

1. Grewal B S, "Numerical methods in Engineering and Science", Khanna Publishers, Delhi.
2. Srimamta Pal Numerical Method Principles, analysis and algorithms, (Oxford Higher ed)
3. Rajaraman V, "Computer Oriented Numerical Methods", PHI, 3rd edition.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **PROGRAMMING WITH JAVA**	Course Code: **DA3230**
Credit: **4**	L: **3** T: **0** P: **2**
Year: **2nd**	Semester: **III**

Unit I : **Object Modeling:** Objects and classes, links and association, generalization and inheritance, aggregation, abstract class, multiple inheritance, meta data, candidate keys, constraints.

Unit II : **Dynamic Modeling:** Events and states, operations, nested state diagrams and concurrency, advanced dynamic modeling concepts, a sample dynamic model.

Unit III : **Functional Modeling:** Data flow diagram, specifying operations, constraints, a sample functional model. OMT (object modeling techniques) methodologies, examples and case studies to demonstrate methodologies, comparisons of methodologies, SA/SD, JSD.

Unit IV : **Java Programming:** Introduction, Operator, Data types, Variables, Methods & Classes, Multithread Programming, I/O, Java Applet.

Java Library: String Handling, Input/Output exploring Java.io, Networking, Applets classes, Event Handling, Introduction to AWT, Working with window, Graphics, AWT Controls, Layout

Manager and Menus, Images, Additional packages.

Unit V : **Software Development using Java:** Java Beans, Java Swing, Java Servlets, Migrating from C++ to java, Application of java, Dynamic Billboard Applet, Image Menu: An image based menu, Lavatron Applets, Scrabblets, JDBC, Brief functioning of upper layer E-mail and their applications.

Text Book:

1. James Rumbaugh etal, "Object Oriented Modeling and Design", PHI.
2. Herbert Schieldt, "The Complete Reference: Java", TMH.
3. E. Balagurusamy, "Programming in JAVA", TMH.

Reference Book:

1. Booch Grady, "Object Oriented Analysis & Design with application 3/e", Pearson Education, New Delhi.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **DISCRETE MATHEMATICS**	Course Code: **DA3010**
Credit: **3.5**	L **3** T **1** P **0**
Year: **2nd**	Semester: **III**

Unit I

Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs, Set Identities.

Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Order of relations.

Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions.

Natural Numbers: Introduction, Mathematical Induction.

Unit II

Partial order sets: Definition, Partial order sets, Combination of partial order sets, Hasse diagram.

Lattices: Definition, Properties of lattices – Bounded, Complemented and Complete Lattice

Boolean algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra. Combinational and sequential Circuits

Unit III

Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem,

Normal Subgroups, Permutation and Symmetric groups, Group Homeomorphisms, Definition and elementary properties of Rings and Fields, Integers modulo n.

Unit IV

Propositional Logic: Proposition, well-formed formula, Truth tables, Tautology, Contradiction, Algebra of proposition, Theory of Inference ,Natural Deduction.

Predicate Logic: First order predicate, well-formed formula of predicate, quantifiers, Inference theory of predicate logic.

Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle.

Probability: Introduction, Conditional Probability & Independence

Unit V

Graphs: Definition and terminology, Representation of graphs, multigraphs, bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring.

Trees: Definition, Binary tree, Binary tree traversal, binary search tree.

Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.

Text Book:

1. Liu C.L., Elements of Discrete Mathematics, McGraw Hill Int. edn.
2. Kolman B & Busby C.R., Discrete Mathematical Structure for Computer Science, Prentice Hall of India Ltd.
3. Deo N., Graph Theory, Prentice Hall of India.

Reference Book:

1. Trembley J.P. & Manohar R., Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **COMPUTER ORGANISATION**	Course Code: **DA3020**		
	L	T	P
Credit: **3.5**	**3**	**1**	**0**
Year: **2nd**	Semester: **III**		

Unit I : **Register Transfer and Micro operation**: Register Transfer Language, Bus and Memory Transfers, Bus Architecture, Arithmetic, Logic, Shift Microoperation, Design of ALU, Design of Fast adder.

Computer Arithmetic: Introduction, addition and subtraction algorithms, Booth Multiplication Algorithms, floating point arithmetic operation, IEEE format for floating point numbers.

Unit II : **Processor Organization**: General register organization, Stack organization, Addressing modes, Instruction format, Data transfer & manipulations, Program Control.

Control Design: Single and multiple bus architecture, Execution of a Complete Instruction, sequencing of control signals, Hardwired control, Micro programmed Control, microinstruction format.

Unit III : **Input-Output Organization**: I/O Interface, Modes of transfer, Interrupts & Interrupt handling, Direct Memory Access, Input-Output processor, Serial Communication.

Unit IV : **Memory Organization**: Memory Hierarchy, Main Memory (RAM and ROM Chips), organization of Cache Memory, Virtual Memory, Memory management hardware.

Unit V : **Parallel Processing**: Flynn's classification, Pipelining- Arithmetic Pipelining, Vector Processing, Array Processor.

Multiprocessor: Characteristic of Multiprocessor, Interconnection Structure, Interprocessor Arbitration.

Text Book:

1. M. Mano, Computer System Architecture, Pearson, 3rd Edition.
2. John P.Hayes, Computer Organization, McGraw Hill, 3rd Edition

Reference Book:

1. Vravice, Zaky&Hamacher Computer Organization, (TMH Publication)
2. Tannenbaum,Structured Computer Organization, (PHI)
3. Stallings ,Computer Organization, (PHI)

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **Digital System Design**	Course Code: **FA3221**
Credit: 4.5	L T P **3 1 2**
Year: **2nd**	Semester: **III**

UNIT-1: INTRODUCTION **8 L**

Number Systems, Basic & Universal Logic gates, Boolean algebra, Direct Conversion of various base, Negative number representations, Floating point number representation, BCD & EXCESS-3 arithmetic, Error detecting and correcting codes: Hamming code, parity code, Review and Limitation of K-Map, Quine-Mcclusky Method (Tabular Method).

UNIT-2: COMBINATIONAL LOGIC CIRCUITS **8 L**

Characterization of digital circuits: Combinational & Sequential Logic circuit, Design procedure: Adders, Subtractors, Parallel Adder, IC-74LS83 and its applications, Multiplier, Decoder, Encoder, Priority Encoder, Multiplexers, Demultiplexers and their applications, Magnitude Comparators, Code Converters, Parity checker and generator, BCD Adder.

UNIT-3: SEQUENTIAL LOGIC CIRCUITS **6 L**

Latch, Flip-Flops and their conversions, Analysis and Synthesis of Sequential Circuits, Excitation Table & Diagram, Counters: Synchronous & Asynchronous, Shift Registers and their applications, Finite State Machine: Mealy and Moore Models.

UNIT-4: MEMORIES **8 L**

Memory Characteristics and operations , Sequential, Random Access-MOS & C-MOS Static and Dynamic Memory elements, Memory organization: One dimensional and Multidimensional Arrangement, Read Only Memory, ROM as a Decoder, Memory Bank, Address Decoding of Memory (Internal & External), PAL, PLA.

UNIT-5: LOGIC FAMILIES, HAZARDS & FAULT DETECTIONS **10 L**

Logic Families: Diode, BJT & MOS as a switching element, concept of transfer characteristics, ECL, TTL, I2L, Tri-state, PMOS,NMOS and CMOS logic families- Power Consumption, Gate delay and Figure of merit (SPP),Package density, Comparison of standard logic families, pass transistor Logic, Open Collector and Totem pole output stage for TTL. Static and Dynamic Hazards, Gate Delay, Generation of Spikes, Analysis & illustration of Hazard in Combinational Circuits, fault Detection Techniques: Path Sensitization, Boolean Difference Method, K- Map Method.

Text Books:

1. Digital Design, M. Morris Mano and M. D. Ciletti, 4th Edition, Pearson

Reference Books:

1. Digital Systems: Principles and Design, Raj Kamal, Pearson
2. Maini, Digital Electronics: Principles and Integrated Circuits, Wiley India.
3. Switching Theory and Finite Automata, Kohavi, TMH Publications.

Digital System Design Lab

1. Implementation of All Logic Gates using Universal gates (NAND & NOR both).
2. Bread-board implementation (Parallel adder, One bit Multiplier, One bit Magnitude comparator, parity checker)
3. Bread-board implementation of any one code converter (i.e. Gray Code, BCD Code, Excess-3, Hex. etc.).
4. Design of shift registers (SISO, SIPO, PIPO, and PISO), up and down counters.
5. Design of Mod-6 types of Asynchronous Counters.
6. Transfer characteristics of TTL and CMOS inverters.
7. Realization of Decoder, Multiplexer, encoder and De-multiplexers using IC 74138.
8. To design & Implement PAL.
9. To design & implement PLA.
10. Clock circuit realization using 555, CMOS inverter.

*Any two (Value Added)

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Course Title: **THEORY OF COMPUTATION**	Course Code: **DA4010**
Credit: **3.5**	L T P **3 1 0**
Year: **2nd**	Semester: **IV**

Unit I : Mathematical preliminaries, alphabets, strings, languages, states, transition, transition graph, generalized transition graph, Deterministic Finite Automata, Non-Deterministic Finite Automata, Non-Deterministic Finite Automata with ϵ transitions, minimization of DFA.

Unit II : Conversions and Equivalence: Equivalence between NFA with and without ϵ transitions. NFA to DFA conversion; Equivalence between two DFA's, Limitations of FSM; Application of finite automata, Finite Automata with output- Moore & Melay machine and its conversion

Unit III : Regular Languages: Regular sets; Regular expressions, Arden's theorem, Construction of finite Automata for a given regular expression, Pumping lemma for regular sets. Closure properties of regular sets. Grammar Formalism: right linear and left linear grammars; Equivalence between regular linear grammar and FA,

Context free grammar; Derivation trees, sentential forms. Ambiguity in context free grammars; Normal forms: Chomsky normal form and Greibach normal form; Pumping Lemma for Context Free Languages, Closure property of CFL.

Unit IV : Push Down Automata: Push down automata, definition; Acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence; Equivalence of CFL and PDA; Introduction to DCFL and DPDA.

Unit V : Turing Machine: Turing Machine, definition, model, Design of TM, Computable functions Church's hypothesis, Types of Turing machines: Universal Turing Machine, Halting problem, Properties of recursive and recursively enumerable languages, unsolvable decision problem, undecidability of Post correspondence problem, Church turing Thesis.

Text Book:

1. Hopcroft H.E. and Ullman J. D ,"Introduction to Automata Theory Language and Computation",., Pearson Education.
2. J. C. Martin, "Introduction to Languages and the Theory of Computation",3rd edition, Tata McGraw-Hill.
3. C.K.Nagpal, "Formal Languages and Automata Theory", Oxford..

Reference Book:

1. Cohen, "Introduction to Computer theory", Wiley India."Elements of Theory of Computation", Lewis H.P. &Papadimitrou C.H. Pearson, PHI.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **Microprocessors**	Course Code: **FA52A0**
Credit: 4.5	L T P **3 1 2**
Year: **3rd**	Semester: **V**

Unit 1

Introduction To Microprocessor: 8085 Evolution Of Microprocessor, Register Structure, ALU, Bus Organization, Timing And Control, instruction set.

Architecture of 16-bit Microprocessors: Architecture of 8086; (Bus Interface Unit, Execution unit) Register Organization, Bus operation, Memory segmentation.

Unit 2

Assembly Language Programming: Addressing Modes and instruction set of 8086, Arithmetic and Logic instructions, Program Control Instructions (jumps, conditional jumps, subroutine call) Loop and string instructions , Assembler Directives.

Unit 3

CPU MODULE: Signal Description of pins of 8086 and 8088, Clock generator, Address and Data bus Demultiplexing, Buffering Memory Organization, Read and Write cycle Timings, Interrupt Structures, Minimum Mode, Maximum Mode Operation.

Unit 4

Peripheral Interfacing: Programmed I/O, Interrupt Driven, I/O, DMA, Parallel I/O, (8255-PPI, Parallel port), 8253/8254 programmable Timer/Counter Interfacing with ADC.

Unit 5

Peripheral Interfacing (Contd.): 8259 Programmable Interrupt controller, 8237 DMA controller, Concept of Advanced 32 bit Microprocessors: Pentium Processor.

Text Book:

1. Ray,A.K. &Burchandi, K.M., "Advanced Microprocessors and Peripherals: Architecture, Programming and Interfacing", Tata McGraw Hill.
2. Hall D.V. , "Microprocessors Interfacing" ,2nd edition, Tata McGraw Hill

Reference Books

1. Gaonkar, Ramesh S., "Microprocessor Architecture, Programming, and Applications with the 8085", Pen Ram International Publishing , 5th edition
2. B.P. Singh &Renu Singh, "Microprocessors and Microcontrollers", New Age International.
3. Liu and Gibson G.A. , "Microcomputer Systems: The 8086/8088 Family", Prentice Hall (India), 2nd edition
4. Brey, Barry B. , "INTEL microprocessors", Prentice Hall (India), 4th edition
5. Ram B., "Advanced Microprocessor & Interfacing" , Tata McGraw Hill
6. Renu Singh & B.P. Singh, "Microprocessors and Interfacing & Applications", New Age International.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **COMPUTER NETWORKS**	Course Code: **DA4210**
Credit: **4**	L: **3** T: **0** P: **2**
Year: **2nd**	Semester: **IV**

Unit I : **Introduction:** Motivation, OSI model, Signals and media, Bits over signals, Synchronous communication, Modulation and modems, Bandwidth, Throughput, and noise, Time division and Frequency division multiplexing, Standards, Switching methods, ISDN.

Unit II : **Packet Transmission:** Multiplexing, Frames, Error correction techniques, LAN/WAN/MAN, Topology, CSMA/CD,LAN protocol, Elementary Data link protocol- Sliding window protocols, Token passing rings, FDDI, IEEE 802.3, 802.5.

Unit III : **Routing Algorithms:** Distance-Vector, Link-State, Shortest path computation, Dijkstra's algorithm, Congestion control, WAN technologies including frame relay, X.25, ATM.

Unit IV : **Internetworking:** Motivation, Concept, Goals, TCP/IP model, IP addressing with sub netting, Address binding with ARP, IP Datagram, Encapsulation IP fragmentation and reassembly, ICMP,IGMP,TCP.

Unit V : **Network Services:** Electronic mail, File transfer, Access and management, Virtual terminals, Remote procedure call.

Text Book:

1. Forouzan, B.A., Data communication and Networking, McGraw Hill (2006) 4th ed.
2. Tanenbaum, A.S., Computer Networks, Prentice Hall (2003) 4th ed.

Reference Book:

1. Comer, D.E., Internetworking with TCP/IP Vol. 1 Principles, Portals and Architecture, Prentice Hall of India (2005) 5th ed.
2. Stallings, W., Computer Networking with Internet Protocols and Tech., Prentice Hall of India (2007).

Department of Computer Science & Engineering
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Course Title: **WEB TECHNOLOGY**	Course Code: **DA4220**		
	L	T	P
Credit: **4**	**3**	**0**	**2**
Year: **2nd**	Semester: **IV**		

UNIT 1

Web Essentials: Clients, Servers, and Communication. The Internet - Basic Internet Protocols - The World Wide Web-HTTP request message - response message - Web Clients Web Servers.

Markup Languages: An Introduction to HTML History-Versions-Basic Syntax and Semantics-Some Fundamental HTML Elements-Relative URLs-Lists-tables-Frames-Forms, Pages style sheets-CSS- Core Syntax- Properties-Box Model Normal Flow Box Layout-Other Properties.

UNIT 2

Client- Side Programming: The JavaScript Language-History and Versions Introduction JavaScript in Perspective-Syntax - Variables and Data Types – Statements – Operators – Literals – Functions – Objects – Arrays - Built-in Objects - JavaScript Debuggers, Browsers and the DOM.

PHP: Starting to script on server side, Arrays, function and forms, Advance PHP.

UNIT 3

Representing Web Data: XML-Documents and Vocabularies-Versions and Declaration-Namespaces JavaScript and XML: Ajax-DOM based XML processing Event-oriented Parsing: SAX-Transforming XML Documents-Selecting XML Data: XPATH-Template based Transformations: XSLT-Displaying XML Documents in Browsers-Case Study- Related Technologies, Introduction to JQuery.

UNIT 4

Web Services: Introduction to Web Services, UDDI, SOAP, WSDL, Developing and deploying web services. Ajax – Improving web page performance using Ajax, Programming in Ajax.

UNIT 5

Web 2.0: Interactive and social web**:** Blogs, wikis, and social networking sites – The technology behind these applications - AJAX, Open APIs.
Web 3.0: Semantic Web, Mashups, RDF, Web based Information Systems, Search engines, Recommender Systems, Web Mining.

Text Book:

1. Jeffrey C.Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.57

Reference Book:

1. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007.
2. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006.
3. Marty Hall and Larry Brown,"Core Web Programming" Second Edition, Volume I and II, Pearson Education, 2001.
4. Bates, "Developing Web Applications", Wiley, 2006.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **DATABASE MANAGEMENT SYSTEM**	Course Code: **DA4230**
Credit: **4**	L: **3** T: **0** P: **2**
Year: **2nd**	Semester: **IV**

Unit I : **Introduction:** Data base System Applications, data base System VS file System, Data Abstraction, Instances and Schemas, data Models: the ER Model, Relational Model & Other Models , Database Languages, data base Users and Administrator, data base System Structure, Storage Manager, the Query Processor, Two/Three tier architecture.

Unit II : **E-R model:** Basic concepts, Design Issues, Mapping Constraints, Attributes and Entity sets, Relationships and Relationship sets, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features

Unit III : **Relational Model & SQL:** Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra; SQL: Form of Basic SQL Query, Nested Queries, Aggregative Operators, NULL values, Logical operators, Outer Joins, Complex Integrity Constraints in SQL.

Unit IV : **Database Design:** Schema refinement, Different anomalies in designing a Database, Decompositions , Problem related to decomposition, Functional Dependency, Normalization using functional dependencies, 1NF, 2NF, 3NF & BCNF , Lossless join decomposition, Dependency preserving Decomposition , Schema refinement in Data base Design, Multi valued Dependencies, 4NF, 5NF

Unit V : **Transaction Management:** Transaction-concepts, states, ACID property, schedule, serializability of schedules, concurrency control techniques - locking, timestamp, deadlock handling, recovery-log based recovery, shadow paging.

Text Book:

1. Raghurama Krishnan, Johannes Gehrke, Data base Management Systems, TATA McGrawHill 3rdEdition.
2. Silberschatz, Korth, Data base System Concepts, McGraw hill, V edition

Reference Book:

1. Peter Rob & Carlos Coronel ,Data base Systems design, Implementation, and Management, 7thEdition.
2. Elmasri Navate ,Fundamentals of Database Systems, Pearson Education.
3. C.J.Date ,Introduction to Database Systems, Pearson Education.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **LINUX ADMINISTRATION AND SHELL PROGRAMMING**	Course Code: **DA4242**
Credit: **4**	L **3** T **0** P **2**
Year: **2nd**	Semester: **IV**

UNIT I

Introduction to Linux and Unix, What is an operating system?,A brief history of UNIX,Architecture of the Linux operating system,Logging into (and out of) UNIX systems,Changing your password,General format of UNIX commands. The UNIX filesystem, Typical UNIX directory structure ,Directory and file handling commands ,Making hard and soft (symbolic) links,Specifying multiple filenames,Quotes.

UNIT II

File and directory permissions ,Inspecting file content ,Finding files,Finding text in files,Sorting files,File compression and backup,Handling removable media ,Processes,Pipes,Redirecting input and output,Controlling processes associated with the current shell ,Controlling other processes

UNIT II

Connecting to remote machines ,Network routing utilities ,Remote file transfer,Other Internet-related utilities,User Information and Communication,Printer control,Email utilities ,Advanced text file processing,Target-directed compilation ,Version control with CVS,C/C++ compilation utilities,Manual pages.

UNIT IV

Introduction to vi,Basic text input and navigation in vi ,Moving and copying text in vi,Searching for and replacing text in vi,Other useful vi commands,Quick reference for vi ,Introduction to emacs,Basic text input and navigation in emacs,Moving and copying text in emacs,Searching for and replacing text in emacs,Other useful emacs commands ,Other UNIX editors. The superuser root,Shutdown and system startup,Adding users ,Controlling user groups ,Reconfiguring and recompiling the Linux kernel ,Cron jobs,Keeping essential system processes alive.

UNIT V

Unix Shell programming: Types of Shells, Shell Metacharacters, Shell variables, Shell scripts, Shell commands, the environment, Integer arithmetic and string Manipulation, Special command line characters, Decision making and Loop control, controlling terminal input, trapping signals, arrays.

Text Book:

1. Sumitabh Das, "Unix Concepts and applications", TMH, 2003
2. *Mike Joy, Stephen Jarvis, Michael Luck, "Introducing Unix and Linux", Palgrave Macmillan.*

Reference Book:

1. O'Reilly Media " Linux System Administration"

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Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **Probability & Random Variable**	Course Code: **JA5010**		
Credit: 3.5	L	T	P
	3	**1**	**0**
Year: 3rd	Semester: **V**		

UNIT 1:

Theory of Probability & Concept of Random Variable

Axioms of probability: set theory, probability space, conditional, probability. Introduction, distribution and density functions, specific random variables, conditional distributions.

UNIT 2 :

Multiple Random Variables

Bi-variate distributions, one function of two random variables, two functions of two random variables, joint moments, joint characteristic functions, conditional distributions Multiple random variables, sequences of random variables

UNIT 3:

Concept of Stochastic Processes & Random Walks and Other Applications

Definition, systems with stochastic inputs, power spectrum, discrete-time processes. Random walks, Poisson points and shot noise, cyclo-stationary Processes, band-limited processes and sampling theory, deterministic signals in noise.

UNIT 4:

Spectral Representation and Estimation & Mean Square Estimation

Factorization and innovations, finite-order systems and state variables, spectral representation of random processes, ergodicity, spectrum estimation. Prediction, filtering and prediction, Kalman filters. Entropy: Basic concepts, random variables and stochastic processes, MEM.

UNIT 5:

Markov Chain & Queuing Theory

Introduction, higher transition probabilities and the Chapman-Kolmogorov equation, classification of states, stationary distributions and limiting probabilities, transient states and absorption probabilities, branching processes. Markov processes.

Characteristics of Queuing Theory, Queuing Models, Birth & Death Process, Little's Theorem.

Text Books:

1. Probability, Random Variables and Stochastic Processes/A. Papoulis & S. U. Pillai / 4th ed./TMH

Reference Books:

1. Probability, Random Variables & Random Signal Principles/Peyton Z. Peebles, Jr. / TMH
2. Probability & Queuing Theory, R. H. Chitale, Technical Publication Pune

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **OPERATING SYSTEMS**	Course Code: **DA5020**
Credit: **3.5**	L: **3** T: **1** P: **0**
Year: **3rd**	Semester: **V**

Unit I

Introduction: Components of a computer System, Operating system: User view & System view, Evolution of operating system, Single Processor & Multiprocessor systems, Real Time System, Distributed Systems, Multimedia Systems, Handheld Systems.

Operating System Structure: Operating System Services, User Operating System Interfaces: Command-Line and GUI, System Calls,

Unit II

Process Management: Process Concept, Process States, Process Transition Diagram, Process Control Block (PCB).

CPU Scheduling: Scheduling Concepts, Performance Criteria, Scheduling Queues, Schedulers, Scheduling Algorithms: Preemptive & Non Preemptive: FCFS, SJF, Priority, Round-Robin.

Unit III

Concurrent Processes: Principle of Concurrency, Producer / Consumer Problem, Co-operating Processes, Race Condition, Critical Section Problem, Peterson's solution, Semaphores, Classical Problem in Concurrency- Dining Philosopher Problem; Inter Process Communication models and Schemes.

Deadlock: System Model, Deadlock Characterization, Prevention, Avoidance and Detection, Recovery from deadlock.

Unit IV

Memory Management: Bare machine, Resident monitor, Multiprogramming with fixed partition, Multiprogramming with variable partition, Multiple base register, Paging, Segmentation, Virtual memory concept, Demand paging, Performance, Paged replaced algorithm, Allocation of frames, Cache memory.

Unit V

File System: Different types of files and their access methods, various allocation methods.

I/O Management and Disk Scheduling: I/O Devices, Organization of I/O functions, Disk Structure, Disk Scheduling (FCFS, SSTF, SCAN, C-SCAN, LOOK).

Text Book:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley.
2. D M Dhamdhere, "Operating Systems : A Concept based Approach", 2nd Edition.

Reference Book:

1. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education. Harvey M Dietel, " An Introduction to Operating System", Pearson Education

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **ALGORITHMS: ANALYSIS & DESIGN**	Course Code: **DA5210**
Credit: **4**	L: **3** T: **0** P: **2**
Year: **3rd**	Semester: **V**

Unit I : **Introduction:** Algorithms, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, Probabilistic analysis.

Unit II : **Divide and conquer:** General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.

Greedy method: General method, applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

Unit III : Transform and conquer , Presorting , Balanced Search trees , AVL Trees , Warshall's and Floyd's Algorithm , Optimal Binary Search trees , Greedy Techniques , Prim's Algorithm , Kruskal's Algorithm Dijkstra's Algorithm , Huffman trees

Unit IV **Backtracking:** N-Queen's Problem, Hamiltonian Circuit problem, Subset-Sum problem, Branch and bound , Assignment problem , Knapsack problem ,Traveling salesman problem.

Unit V : **NP-Hard and NP-Complete problems:** Basic concepts, non deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem.

Text Book:

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, "Introduction to Algorithms", PHI Pvt. Ltd., 20012.
2. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia,2003 3.
3. M.T.Goodrich and R.Tomassia , Algorithm Design: Foundations, Analysis and Internet examples, Johnwiley and sons.

Reference Book:

1. R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, Introduction to Design and Analysis of Algorithms A strategic approach, McGraw Hill.
2. Aho, Ullman and Hopcroft ,Design and Analysis of algorithms, ,Pearson education.
3. Ellis Horowitz, Satraj Sahni and Rajasekharam, Fundamentals of Computer Algorithms, Galgotia publications pvt. Ltd.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **ADVANCED JAVA PROGRAMMING**	Course Code: **DA5220**
Credit: **4**	L: **3** T: **0** P: **2**
Year: **3rd**	Semester: **V**

UNIT 1
J2SE: Concepts and Prerequisites: Data Types, Arrays, Dynamic Arrays, Type Casting, Classes and Objects, Inheritance, Interfaces, Exception Handling, Multi-Threading.
J2EE Architecture: J2EE as a framework, Client Server Traditional model, Comparison amongst 2-tier, 3-tier and N-tier architectures.

UNIT 2
JDBC: Introduction, JDBC Architecture, Types of JDBC Drivers, The Connectivity Model, The java.sql package, Navigating the Result Set object's contents, Manipulating records of a Result Set object through User Interface , The JDBC Exception classes, Database Connectivity, Data Manipulation (using Prepared Statements, Joins, Transactions, Stored Procedures).

UNIT 3
Java Beans: The software component assembly model- The java beans development kit- developing beans JAR files-Introspection-Bound Properties-Persistence-customizers - java beans API. EJB: EJB architecture-EJB requirements –EJB session beans- EJB entity beans-EJB Clients.

UNIT 4
Java Servlet: Servlet overview, Brief origin and advantages over CGI, Writing small Servlet Programs, Deployment Descriptor, Servlet Life Cycle, Sharing Information, Initializing a Servlet, Writing Service Methods, Filtering Requests and Responses, Invoking Other Web Resources, Accessing the Web Context, Maintaining Client State, Finalizing a Servlet, Session: Definition, Different ways to track sessions.

UNIT 5
JSP: Introduction to JSP, JSP processing, JSP Application Design, Tomcat Server, Implicit JSP objects, Conditional Processing, Declaring variables and methods, Error Handling and Debugging, Sharing data between JSP pages- Sharing Session and Application Data. Accessing a database from a JSP page, Application-specific Database Action, Developing Java Beans in a JSP page, introduction to Struts framework.

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Text Book:

1. J. McGovern, R. Adatia,Y. Fain, 2003, J2EE 1.4 Bible, Wiley-dream tech India Pvt. Ltd, New Delhi.
2. H. Schildt, 2002, Java 2 Complete Reference, 5th Edition, Tata McGraw-Hill, New Delhi.

Reference Book:

1. K. Moss, 1999, Java Servlets, Second edition, Tata McGraw Hill, New Delhi.
2. D. R. Callaway, 1999, Inside Servlets, Addison Wesley, Boston.
3. Joseph O'Neil, 1998, Java Beans from the Ground Up, Tata McGraw Hill, New Delhi.
4. Tom Valesky, Enterprise JavaBeans, Addison Wesley.
5. Cay S Horstmann & Gary Cornell, Core Java Vol II Advanced Features, Addison Wesley

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **ARTIFICIAL INTELLIGENCE**	Course Code: **DA5230**
Credit: **4**	L: **3** T: **0** P: **2**
Year: **3rd**	Semester: **V**

Unit I : **Introduction:** History of AI, Intelligent agents – Structure of agents and its functions, Problem spaces and search - Heuristic Search techniques – Best-first search, Problem reduction -Constraint satisfaction - Means Ends Analysis.

Unit II : **Knowledge Representation**: Approaches and issues in knowledge representation, Knowledge Based Agent, Propositional Logic, Predicate logic – Unification – Resolution, Weak slot – filler structure, Strong slot - filler structure.

Unit III : **Reasoning under uncertainty**: Logics of non-monotonic reasoning, Implementation, Basic probability notation, Bayes rule, Certainty factors and rule based systems, Bayesian networks, Dempster - Shafer Theory, Fuzzy Logic.

Unit IV : **Planning and Learning:** Planning with state space search, conditional planning, continuous planning, Multi-Agent planning. Forms of learning - inductive learning – Reinforcement Learning - learning decision trees - Neural Net learning and Genetic learning.

Unit V : **Advanced Topics: Game Playing:** Minimax search procedure - Adding alpha-beta cutoffs.

Expert System: Representation - Expert System shells - Knowledge Acquisition. CASE STUDY- Dendral, Mycin.

Swarm Intelligent Systems – Ant Colony System, Development, Application and Working of Ant Colony System.

Text Book:

1. Elaine Rich, Kevin Knight and Shivashankar B.Nair, "Artificial Intelligence", Tata McGraw-Hill, Third edition, 2009. (UNITs I, II, III & V)
2. Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education Asia, Second edition, 2003. (UNIT IV)
3. N. P. Padhy, "Artificial Intelligence and Intelligent System", Oxford University Press, Second edition, 2005. (UNIT V)

Reference Book:

1. Rajendra Akerkar, "Introduction to Artificial Intelligence", Prentice-Hall of India, 2005.
2. Patrick Henry Winston, "Artificial Intelligence", Pearson Education Inc., Third edition, 2001.
3. Eugene Charniak and Drew Mc Dermott, "Introduction to Artificial Intelligence", Addison-Wesley, ISE Reprint, 1998.
4. Nils J.Nilsson, "Artificial Intelligence - A New Synthesis", Harcourt Asia Pvt. Ltd., Morgan Kaufmann, 1988.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **Principles of Management**	Course Code: **HA5010**
Credit: 2	L T P **2 0 0**
Year: **3rd**	Semester: **VI**

UNIT – 1
Introduction to Management
Theories of management: Traditional behavioral, contingency and systems approach. Organization as a system.

UNIT – 2
Management Information
Interaction with external environment, Managerial decision making and MIS.

UNIT – 3
Planning Approach to Organizational Analysis
Design of organization structure; Job design and Enrichment; Job evaluation and merit rating.

UNIT – 4
Leading and Control
Theories of motivation, Leadership styles and managerial grid. Co-ordination, Monitoring and Control in organizations. Techniques of Control. Japanese management techniques.

Minor Project: Submission of 15 pages of Case Studies on above.
Suggested Books:

1. Peter Drucker, Harper and Row: The Practice of Management.
2. *Koontz H,* Weihrich,H. Essentials of Management, *Tata McGraw-Hill* Education, 2006.
3. Schermerhorn, John R. Management and Organizational Behavior Essentials, Wiley India,2005
4. Staner: Management, PHI Learning
5. Hirschey. Managerial Economics, Cengage Learning, 2009.
6. Chhabra, A. Principle of Management, Sun India publication , 2012

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **COMPUTER GRAPHICS**	Course Code: **DA6210**
Credit: **4**	L: **3** T: **0** P: **2**
Year: **3rd**	Semester: **VI**

Unit I : **Introduction to computer graphics and primitives algorithms:** Points, planes, pixels and frames buffers, lines, circles and ellipse drawing algorithms, display devices, primitive devices, applications of computer graphics.

Unit II : **Two-Dimensional Transformation:** Introduction to transformation matrix, **Types of transformations in 2-D:** Identity Transformation, Scaling, Reflection, Shear Transformation, Rotation, Translation, Rotation about an arbitrary point, Combined Transformation, Homogeneous coordinates, 2-D transformation using homogeneous coordinates.

Unit III : **Three-Dimensional Transformation:** Objects in homogeneous coordinates, **3-D Transformation:** Scaling, Translation, Rotation, Shear Transformations, Reflection, world coordinates and viewing coordinates, Projection, parallel Projection, Perspective projection. **Hidden Lines and Surfaces:** Back face removal algorithms, Hidden lines methods..

Unit IV : **Viewing and Solid Area Scan-Conversion:** Introduction to viewing and clipping, viewing transformation in 2-D, Point Clipping, Line Clipping, Introduction to polygon Clipping, Viewing and clipping in 3-D, Three Dimensional Viewing Transformations, Text Clipping, generalize Clipping, Multiple windowing.

Introduction to Solid Area Scan: Conversion, Inside-Outside Test, Winding Number Method and Coherence Property, Polygon Filling, Seed Fill Algorithms, Scan Line Algorithm, priority Algorithm, Scan Conversion of Characters, Aliasing, Anti-aliasing, Halfoning, Threshold and Dithering.

Unit V : **Introduction to curves:** Curves Continuity, Conic Curves, Piecewise Curve Design, Spline curve representation, Bezier Curves, Fractals and its Applications.

Object rendering: Introduction to Object Rendering, Shading, Ray Tracing, Illuminational model, Colour Models.

.Text Book:

1. R.K. Maurya, Computer Graphics, John Willey.
2. David F. Rogers, Procedural Elements of Computer Graphics, Tata McGraw Hill.

Reference Book:

1. Donald hearn and M.Pauline Beaker, Computer Graphics, Prentice Hall of India.
2. Steven Harrington, Computer Graphics, McGraw Hill.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **DOT NET TECHNOLOGIES**	Course Code: **DA6220**
Credit: **4**	L **3** T **0** P **2**
Year: **3rd**	Semester: **VI**

Unit I : **Introduction to C#:** C# Language Fundamentals: An Anatomy of a basic class, Creating objects: Constructor basic, the composition of an application, Default Assignment and variable scope, member initialization syntax, Basic input and output with the console class, Understanding value types and reference types, the master node: System. Objects, The system Data type (And C# aliases), Converting between value type and reference type: Boxing and Unboxing, Defining program constraints, Iterations constructs, control flow constructs, The complete set operator, Defining Custom class methods, Understanding static methods, Method parameter modifiers, Array manipulation, String manipulation, Enumerations, Defining structures, Defining custom namespaces.

Unit II : **Object Oriented Aspects Of C#:** Formal definition of the class, Definition the "Default public interface" of a type, Recapping the pillars of OOP, The first pillar: Encapsulation services, Pseudo Encapsulation: Creating read only field, The second pillar: Inheritance supports keeping family secrets: The "Protected" keyword, The Nested type definitions, The third pillar: Polymorphic support casting between types, Generating class definitions using Visual Studio.Net. Exceptions and Objects Life Time Ode to errors, Bugs and exceptions, the role of .NET exceptions handling, the system. Exception base class throwing a generic exception catching exception, CLR system level exception(System. system exception), Custom application level exception (System. application exception), Handling multiple exception, The finally block The last chance exception, dynamically identify application and system level exception, Debugging system exception using VS.Net, Understanding Object life time, The CIT of new, The basic of garbage collection, Finalizing a type, Finalization process, building and Ad hoc destruction method, garbage collection optimization, The system .GC type.

Unit III : **The Clr And The .Net Framework:** The building Block of the .NET platform (CLR,CTS,CLS), the role of the .NET base class libraries, , additional .NET Aware programming Languages, Understanding .Net Assembles, Problems with classic COM Binaries, The role of the common intermediate language, The role of .NET type metadata, The role of the assembly manifest, Compiling CIL to platform specific instruction. Building a simple file test assembly, Cross Language Inheritance. Building the multi file assembly, Using the multi file assembly, Understanding private assemblies, robing for private assemblies (The Basics), Private assemblies and XML Configuration files, Probing for private assemblies (The details),Understanding Shared assembly, Understanding Shared Names, Building a shared assembly, Understanding delay Signing, Installing/Removing shared assemblies, Using a Shared assembly.

Unit IV : **Application Development On .Net:** Using the visual studio.Net IDE, key aspects of the VS.Net IDE, Documenting source code via XML, Building Windows Applications, Event Driven Programming, Delegate, Event and its association, Synchronous and asynchronous operation with delegate, User Defined events and delegates,ADO.NET Architecture,.NET Framework Data Providers, Data set, Data reader, data adapter, Accessing Data with ADO.NET..

Unit V : **Web Based Application Development On .Net:** Introduction to web form, Need of Web Application, Static and Dynamic Page, Working of IIS and Browser, Differences between ASP and ASP.NET, understanding post back, understanding page life cycle, State management, Server control form validation, Master pages, ASP.NET web security, server control form validation, Programming Web Applications with Web Forms, Web service, Programming Web Services

.

Text Book:

1. E. Balagurusamy, "Programming in C#", Tata McGraw-Hill, 2004. (Unit I, II)
2. J. Liberty, "Programming C#", 2nd ed., O'Reilly, 2002. (Unit III, IV, V)

Reference Book:

1. Herbert Schildt, "The Complete Reference: C#", Tata McGraw-Hill, 2004.
2. Robinson et al, "Professional C#", 2nd ed., Wrox Press, 2002.
3. Andrew Troelsen, "C# and the .NET Platform", A! Press, 2003.
4. S. ThamaraiSelvi, R. Murugesan, "A Textbook on C#", Pearson Education, 2003.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **COMPILER DESIGN**	Course Code: **DA6230**
Credit: **4**	L: **3** T: **0** P: **2**
Year: **3rd**	Semester: **VI**

Unit I : **Introduction:** Review of Languages & Grammar, Compiler and Interpreter- Basic Concepts. Phases and Passes, Design Issues using Finite State Machines, Scanner Generator- LEX. Formal Grammar and their application to Syntax Analysis, Ambiguous Grammar, The Syntactic specification of Languages: CFG, Derivation and Parse Trees, Capabilities of CFG, BNF Notation.

Unit II : **Basic Parsing Techniques:** Parsing-Top Down and Bottom-Up Strategies: General Consideration. Top Down Parsing: Brute-Force Method, Recursive Descent, & Predictive Paring. Bottom-Up Parsing: Shift Reduce Parsing, Operator Precedence Parsing. LR Grammars-LR(0), SLR(1), Canonical LR(1) & LALR(1) Parser, Comparison of parsing methods.

Unit III : **Semantic Analysis:** Basic Concepts, Syntax Directed Definitions-Inherited & Synthesized Attributes, Evaluation Orders of SDDs. Syntax directed Translation Schemes, Intermediate Codes, Postfix notation, Parse Trees and Syntax Trees, Directed Acyclic Graphs, Three address Codes: Quadruple & Triples, Translation of Assignment Statements, Boolean expressions, Control Statements, Postfix Translation, Translation with a Top Down Parser, Array References in Arithmetic expressions, Procedure Calls, Declarations and Case statements Translations.

Unit IV : **Symbol Tables:** Organization of Non-Block Structured Language (Unordered /Ordered/ Tree/ Hash) and Block Structured Language (Stack Tables & Stack Implementation), Runtime Storage Management: Static Allocation, Dynamic Allocation- Activation Records and their usage, Recursive Procedure. Heap Allocation-Storage Registers and Release Strategies.

Unit V : **Error detection and Recovery:** Code Optimization- Basic Blocks and Optimization, Loop Optimization, Flow Graph Analysis, Machine Dependent Optimization.

Error Handling: Detection, Reporting, Recovery and Maintenance, Compiler-Compiler—YACC, Code Generation, Concept of Compiler Design for Object-Oriented Language.

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.Text Book:

1. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, "Compilers-Principles, Techniques & Tools", Pearson Education

Reference Book:

1. Robin Hunter, " Essence of Compilers", Pearson Education
2. Steven S. Muchnick, Advanced Compiler Design & Implementation, Morgan Kaufmann Publishers

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **SOFTWARE ENGINEERING**	Course Code: **DA6010**
Credit: **3**	L: **3** T: **0** P: **0**
Year: **3rd**	Semester: **VI**

Unit I : **Introduction** to Software Engineering, Software Characteristics, Software Crisis, Software Engineering Processes, Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models

Unit II : **Software Requirement Analysis and Specifications:** Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Data Flow Diagrams, Data Dictionaries, Entity-Relationship diagrams, Software Requirement and Specifications, Functional and non-Functional requirements, Software Prototyping, Feasibility Study, Information Modeling, Decision Tables, SRS Document, IEEE Standards for SRS, Software Quality Assurance (SQA),SEI-CMM Model.

Unit III : **Design:** Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead‟s Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

Unit IV : **Software Reliability:** Failure and Faults, Reliability Models: Basic Model, Logarithmic Poisson Model, Calender time Component, Reliability Allocation. **Coding:** Top-Down and Bottom –Up programming, structured programming, Compliance with Design and Coding Standards.

Unit V : **Testing:** Objectives, Testing Tools & Standards. Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Path Testing, Structural Testing (White Box Testing), Functional Testing (Black Box Testing),

Maintenance: Corrective and Perfective Maintenance, Maintenance Process, Maintenance Models, Maintenance Cost, Software Re-Engineering, Reverse Engineering. Constructive Cost Models (COCOMO).
Software Quality Management: Software Quality Factors, Quality Assurance, Quality Standards, Software Maintenance.

.Text Book:

1. R. S. Pressman, “Software Engineering – A practitioner’s approach”, 3rd ed., McGraw Hill Int. Ed., 1992.
2. K.K. Aggarwal & Yogesh Singh, “Software Engineering”, New Age International, 2001
3. Pankaj Jalote, Software Engineering, Wiley India

Reference Book:

1. Rajib Mall, Fundamentals of Software Engineering, PHI Publication, 3rd Edition.
2. Ian Sommerville, Software Engineering, Addison Wesley, 8th Edition.
3. James Peter, W Pedrycz, “Software Engineering”, John Wiley & Sons.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **Engineering Economics**	Course Code: **GC5010**
Credit: 2	L T P **2 0 0**
Year: **3rd**	Semester: **VI**

UNIT-I

Time value of money: Simple and compound interest, Time value equivalence, Compound interest factors, Cash flow diagrams, Calculation, Calculation of time –value equivalences. Present worth comparisons, Comparisons of assets with equal, unequal and infinite lives, comparison of deferred investments, Future worth comparison, payback period comparison.

UNIT-II

Use and situations for equivalent annual worth comparison, Comparison of assets of equal and unequal life. Rate of return, Internal rate of return, comparison of IIR with other methods, IRR misconceptions.

UNIT-III

Analysis of public Projects: Benefit/ Cost analysis, quantification of project, cost and benefits, benefit/ cost applications, Cost –effectiveness analysis.

UNIT-IV

Depreciation, computing depreciation charges, after tax economic comparison, Break-even analysis; linear and non-linear models. Product and Process Costing, Standard Costing, cost estimation, Relevant Cost for decision making, Cost control and Cost reduction techniques.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: Title: **Fundamental of Cloud Computing**	Course Code: **DA6610**
Credit: **3**	L T P **3 0 0**
Year: **3rd**	Semester: **VI**

Unit I

Overview of cloud computing : What is a cloud, Definition of cloud , Definition of cloud ,characteristics of cloud ,Why use clouds, How clouds are changing , How clouds are changing , Driving factors towards cloud, Comparing grid with cloud and other computing systems, workload patterns for the cloud, "Big Data", IT as a service.

Unit II

Cloud computing concepts: Concepts of cloud computing, Cloud computing leverages the Internet, Positioning cloud to a grid infrastructure, Elasticity and scalability, Virtualization, Characteristics of virtualization, Benefits of virtualization, Virtualization in cloud computing, Hypervisors, Multitenancy, Types of tenancy, Application programming interfaces (API), Billing and metering of services , Economies of scale, Management, tooling, and automation in cloud computing, Management: Desktops in the Cloud, Security.

Unit III

Cloud service delivery: Cloud service , Cloud service model architectures, Infrastructure as a service (IaaS) architecture, Infrastructure as a service (IaaS) details, Platform as a service (PaaS) architecture, Platform as a service (PaaS) details, Platform as a service (PaaS) , Examples of PaaS software, Software as a service (SaaS) architecture, Software as a service (SaaS) details, Examples of SaaS applications, Trade-off in cost to install versus , Common cloud management platform reference architecture: Architecture overview diagram, Common cloud management platform.

Unit IV

Cloud deployment scenarios: Cloud deployment models, Public clouds, Hybrid clouds, Community, Virtual private clouds, Vertical and special purpose, Migration paths for cloud, Selection criteria for cloud deployment.

Unit V

Cloud computing Security : Cloud security reference model, How security gets integrated , Cloud security , Understanding security risks, Principal security dangers to cloud computing, Virtualization and multitenancy, Internal security breaches, Data corruption or loss, User account and service hijacking, Steps to reduce cloud security breaches, Steps to reduce cloud security breaches, Reducing cloud security, Identity management: Detection and forensics, Identity management: Detection and Identity management, Benefits of identity, Encryption techniques, Encryption & Encrypting data , Symmetric key encryption, Asymmetric key encryption, Digital signature, What is SSL? IBM Smart Cloud, Amazon Web Services, Google Cloud platform, Windows Azure platform, A comparison of Cloud Computing Platforms, Common building Blocks.

Text Book:

1. R. Buyya, C. Vecchiola, S. T. Selvi, Matering Cloud Computing, Ed. Third reprint 2013, Mc Graw Hill education (India) Pvt. Ltd.
2. B. Sosinsky, Cloud computing Bible, Ed. Reprint 2014, Willy India Pvt. Ltd.

Reference Book:

1. M. Miller, Cloud Computing, Ed. 9th 2014, Pearson education in South Asia.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **Genetic Algorithms & Probabilistic Reasoning**	Course Code: **DA6620**
Credit: **3**	L: **3** T: **0** P: **0**
Year: **3rd**	Semester: **VI**

UNIT 1 **(8L)**

Fuzzy Sets (Introduction)

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory, Basic operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

UNIT2 **(8L)**

Fuzzy Logic (Fuzzy Membership, Rules)

Membership functions, Propositional logic and predicate logic, Inference in fuzzy logic, Fuzzy if-then rules, Fuzzy mapping rules, Fuzzy implications, Min-Max Theorem, Resolution Rule under Fuzzy environment, Refutation method for theorem proving, Defuzzifications,

UNIT3

(8L)

Reasoning with uncertain and incomplete information: The statistical approach to uncertainty, Introduction, Uncertain & incomplete knowledge. Review of Probability theory

UNIT4

(8L)

Bayes Theorem, Bayesian Networks, Bayesian reasoning. Decision Making, Joint Probabilities, Relationships, Polytrees., Dempster-Shafer theory of evidence, Certainty Factor, Non-monotonic systems.

UNIT 5 **(8L)**

Theoretical Foundation of Genetic Algorithms

Introduction: Basic Operators: Reproduction, Crossover & Mutation. Fitness function. Search Space, Schemas & Two-Armed and k-armed problem, Exact mathematical models, Applications of Genetic Algorithms.

Text Book:

1. G.J.Klir , Yuan,"Fuzzy Sets and fuzzy logic, Theory and applications", Prentice Hall India, 1995.
2. David E. Goldberg, "Genetic algorithms in search, optimization & Machine Learning" Pearson Education, 2006
3. Stuart Russel, Peter Norvig, "Artificial Intelligence A Modern Approach" Pearson (3rd Ed.)

Reference Book:

1. John Yen, Reza Langari, "Fuzzy Logic Intelligence, Control and Information", Pearson Education, 2006.
2. Timothy J Ross, "Fuzzy Logic with Engineering Applications", 2nd Edition, John Wiley, 2004.
3. H. Zimmermann, "Fuzzy Set Theory and its applications", 2nd Edition, Allied Publishers, 1996.
4. Melanle Mitchell, "An introduction to genetic algorithms", Prentice Hall India, 2002.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **Game Design & Development**	Course Code: **DA6630**
Credit: **3**	L: **3** T: **0** P: **0**
Year: **3rd**	Semester: **VI**

Unit 1 **Introduction:** History of Video Games, Impact of Games on Society, Game Design, Game types, Game genres, Game Writing, UI Layout, Asset Management, game state, gamer services and Interactive Storytelling Understanding Hardware, Input Devices, Output Devices, Network Requirements, Managing Game Performance, CPU vs. GPU, and Graphics Networking Performance.

Unit 2 **Game Design and Development Concepts:** Mathematical concepts, Collision Detection and resolution, Real-time game Physics, Graphics, Character Animation, Animate basic characters, Transform objects, Artificial Intelligence Agents, Architecture, and Techniques, Overview of Path finding, Audio Programming, Networking and Multiplayer.

Unit 3 **Audio Visual Design and Production:** Visual Design, 3D Modelling, 3D Environments, 2D Textures and Texture mapping, Special Effects, Lighting, Animation, Cinematography, Audio design and production.

Unit 4 **Game Programming:** Languages and Architecture Teams and Processes, C++, Java and Scripting languages, Programming Fundamentals, Game Architecture, Memory and I/O system, Debugging Games, Introducing C++, Conditionals, Loops, and Arrays, Functions, References and Pointers, Object Oriented Programming: Classes, Dynamic Memory, Strings, Operator Overloading, File Input/Output, Inheritance and Polymorphism, Templates, Exception Handling, Number Systems, The Standard Template Library, Win32 Programming: Basic Windows Programming, GDI and Menus, Dialogs and Controls, Sprite Animation, AI Techniques implementation.

Unit 5 **Working with Unity and Scripting:** Unity Demos, Courses Wiki, Lesson Files, Managing Project, Interface and Assets, Unity Interfaces, Prototyping and Scripting Basics, Collection, Inventory and HUD, Building Unity Game, Terrain, Unity Terrain Assets, Camera, Layer, GUI, Curves, Surfaces, Visible Surface Identification, 2D Games, UVs Animation, Movie and Audio, Scene Modelling, Unity Optimization Application and Techniques, Unity Deployment methods, character scripting.

Text Books:

1. Steve Rabin, "Introduction to Game Development", 2nd Edition, Cengage Technology, 2010.
2. Michael Dawson, "Beginning C++ Through Game Programming", 3rd edition, Cengage Learning, 2010.
3. Will Goldstone, "Unity 3.x Game Development Essentials" Packt Publishing Ltd, 2011.

Reference Books:

1. Kelly C., "Programming 2D Games", 1st edition, A K Peters/CRC Press, 2012.
2. A. Thorn, "Learn Unity for 2D Game Development", Apress, 1st edition, October 9, 2013.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **Mobile Computing**	Course Code: **DA6640**
Credit: **3**	L: **3** T: **0** P: **0**
Year: **3rd**	Semester: **VI**

Unit I

Introduction: Introduction to mobile computing. Convergence of Internet, digital communication and computer networks. Sharing of wireless channels: FDMA, TDMA, CDMA. MAC layer issues in wireless communication

Unit II

Mobility Management: Impacts of mobility and portability in computational model and algorithms for mobile environment. Disconnected operation, handling handoffs. Analysis of algorithms and termination detection.Types of Mobility. Mobility in cellular based wireless network: channel allocation, interferences, handoffs and location management. IP mobility: Mobile IP and IDMP

Unit III

Wireless LAN: Infrared vs. Radio transmission, Infrastructure and Ad hoc Networks, IEEE 802.11: System architecture, Protocol architecture, Physical layer, Medium access control layer, MAC management, Future development; HIPERLAN: Protocol architecture, Physical layer, Channel access control.Sub layer, Medium access control Sub layer, Information bases and Networking; Bluetooth: User scenarios, Physical layer, MAC layer, Networking. Security, Link management. Personal Area Network: Bluetooth and ZigBee. Network layer issues ad hoc and sensor networks

Unit IV

Data Models: Data delivery models: push and pull. Data dissemination in wireless channels. Broadcast disks. Effects of caching,Indexing in Air, Mobile Databases and transaction

Unit V

Distributed Mobile Environment: Distributed file system for mobile environment, Mobile Middleware: Service discovery, adaptation, mobile agents.

Text Book:

1. Schiller, “Mobile Communications”, PHI/Pearson Education, Second Edition.
2. William Stallings, “Wireless Communications and Networks”, PHI/Pearson Education.

Reference Book:

1. T. Rappaport, "Wireless Communication: Principles and Practice", Pearson Education.
2. Reza B'Far (Ed), "Mobile Computing Principles", Cambridge University Press.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **Data Base Administration**	Course Code: **DA6650**
Credit: **3**	L: **3** T: **0** P: **0**
Year: **3rd**	Semester: **VI**

UNIT I Introduction

Oracle Architectural Components, Getting Started With Oracle Server , Managing an Oracle Instance, Creating a Database, Data Dictionary Contents and Usage, Maintaining the Control File, Redo Log Files, Managing Tablespaces and Data Files, Storage Structures and Relationships, Managing Undo Data, Tables, Indexes, Maintaining Data Integrity, Managing Password, Managing Security, Resources, users, Privileges & Roles, Loading Data Into a Database & Globalization Support

UNIT II DBA Fundamentals

Networking Overview, Basic Oracle Net Architecture, Server-Side Configuration, Basic Oracle Net Services Client-Side Configuration, Usage and Configuration of the Oracle Shared Server, Backup and Recovery Overview, Instance and Media Recovery Structures, Configuring the Database Archiving Mode, Oracle Recovery Manager Overview and Configuration, User Managed Backups, RMAN Backups, User Managed Complete & Incomplete Recovery, RMAN Complete Recovery, Incomplete Recovery & Maintenance, Recovery Catalog Creation and Maintenance, Transporting Data Between Databases

UNIT III Performance Tuning

Overview Of Oracle 9i Performance Tuning, Diagnostic and Tuning Tools, Sizing the Shared Pool & the Buffer Cache, Sizing The Other SGA Structures, Database Configuration and I/O Issues, Optimizing Sort Operations, Diagnosing Contention For Latches, Tuning Rollback Segments, Monitoring and Detecting Lock Contention, Tuning The Oracle Shared Server, Application Tuning, Using Oracle Blocks Efficiently SQL Statement Tuning, Tuning the OS and Using Resource Manager

UNIT IV Managing Oracle

Oracle10i: Overview, Preparing the Operating System & Install Oracle9i Software, Create a Custom Oracle Database, Install and Configure Enterprise Manager, Customize the Oracle Database Linux Measurement Tools, Oracle Measurement Tools, Tuning Oracle

UNIT V Database Troubleshooting

One Time Troubleshooting, Adhoc Troubleshooting, Escalations, Connectivity, Business Continuity, High Availability and Scalability, Data Sharing and information Integration

Text Book:

1. Oracle Database Administrator's Guide
2. Oracle DBA Handbook

Reference Book:

1. Michael Wessler Oracle DBA on Unix and Linux

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **DISTRIBUTED COMPUTING**	Course Code: **DA7010**
Credit: **3.5**	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VII**

Unit I : **Fundamentals of Distributed Computing:** Introduction to distributed computing Systems, Resource
sharing and the Web Challenges.
System Models: Architectural models, Fundamental Models
Theoretical Foundation for Distributed Computing System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks, Causal ordering of messages, global state, termination detection.

Unit II : **Distributed Mutual Exclusion**: Classification of distributed mutual exclusion, requirement of mutual
exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.
Distributed Deadlock Detection: system model, resource Vs communication deadlocks deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

Unit III : **Distributed Objects and Remote Invocation**: Communication between distributed objects, Remote
procedure call, Events and notifications, Java RMI case study.
Distributed File Systems: File service architecture, Sun Network File System, The Andrew File System, Recent advances.

Unit IV : **Transactions and Concurrency Control**: Flat and nested distributed transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control.
Distributed Transactions: Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Atomic Commit protocols.

Unit V : **Introduction to Grid Computing:** Basics of grid Computing, Benefits of grid computing, Grid terms and concepts, Grid user roles, Standards for grid environments, Grid security requirements.
Introduction to Parallel Processing: Basic Concepts: Introduction to parallel processing, parallel processing terminology, Parallel & Distributed Programming: Parallel Programming environments

Text Book:

1. Tannenbaum, A, Van Steen. Distributed Systems, Principles and Paradigm , Prentice Hall India, 2002
2. Tannenbaum, A. Distributed Operating Systems, Pearson Education. 2006

Reference Book:

1. Attiya, Welch, "Distributed Computing", Wiley India, 2006
2. Singhal and Shivaratri, "Advanced Concepts in Operating Systems", McGraw Hill, 1994
3. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Ed.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **ADVANCED COMPUTER ARCHETECTURE**	Course Code: **DA7020**
Credit: **3.5**	L T P **3 1 0**
Year: **4th**	Semester: **VII**

UNIT 1 ***(6L)***

Introduction: Parallel Computing, Parallel Computer Model, Program and Network Properties, Parallel (Architectural Classification Schemes, Flynn's & Feng's Classification, Performance Metrics and Measures, Speedup Performance Laws: Multiprocessor System and Interconnection Networks; IEEE POSIX Threads: Creating and Exiting Threads, Simultaneous Execution of Threads, Thread Synchronization using Semaphore and Mutex, Canceling the Threads.

UNIT 2 ***(9L)***

Pipelining and Memory Hierarchy: Basic and Intermediate Concepts, Instruction Set Principle; ILP: Basics, Exploiting ILP, Limits on ILP; Linear and Nonlinear Pipeline Processors; Super Scalar and Super Pipeline Design; Memory Hierarchy Design: Advanced Optimization of Cache Performance, Memory Technology and Optimization, Cache Coherence and Synchronization Mechanisms.

UNIT 3 ***(8L)***

Thread and Process Level Parallel Architecture: Introduction to MIMD Architecture, Multithreaded Architectures, Distributed Memory MIMD Architectures, Shared Memory MIMD Architecture, Clustering, Instruction Level Data Parallel Architecture, SIMD Architecture, Fine Grained and Coarse Grained SIMD Architecture, Associative and Neural Architecture, Data Parallel Pipelined and Systolic Architectures, Vector Architectures.

UNIT 4 ***(8L)***

Parallel Computing model: Sequential model, need of alternative model, parallel computational models such as PRAM, LMCC, Hypercube, Cube Connected Cycle, Butterfly, Perfect Shuffle Computers, Tree model, Pyramid model, Fully Connected model, PRAM-CREW, EREW Models.

UNIT 5 ***(9L)***

Parallel Algorithms: PRAM Algorithms: Parallel Reduction, Prefix Sums, Preorder Tree Traversal, Merging two Sorted lists; Matrix Multiplication: Row Column Oriented Algorithms, Block Oriented Algorithms; Parallel Quicksort, Hyper Quicksort; Solving Linear Systems: Gaussian Elimination, Jacobi Algorithm; Parallel Algorithm Design Strategies.

Text Book:

1. Kai Hwang," Advance Computer Architecture", TMH
2. Matthew, "Beginning Linux Programming", SPD/WROX

Reference Book:

1. Hennessy and Patterson," Computer Architecture: A Quantitative Approach", Elsevier
2. Dezso and Sima, "Advanced Computer Architecture", Pearson
3. Quinn, "Parallel Computing: Theory & Practice", TMH
4. Quinn, "Parallel Programming in C with MPI and Open MP", TMH

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **CRYPTOGRAPHY AND NETWORK SECURITY**	Course Code: **DA7210**		
Credit: **4**	L **3**	T **0**	P **2**
Year: **4th**	Semester: **VII**		

Unit I : Introduction to security attacks, services and mechanism, introduction to cryptography.

Conventional Encryption: Conventional encryption model, classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography,stream and block ciphers.

Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard(DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES, confidentiality using conventional encryption, traffic confidentiality, key distribution

Unit II : Introduction to prime and relative prime numbers, finite field of the form GF(p), modular arithmetic, Fermat's and Euler's theorem, primarily testing, Euclid's Algorithm, Chinese Remainder theorem, Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffie-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elgamel encryption.

Unit III : **Message Authentication and Hash Function:** Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm(SHA).Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm.

Unit IV : **Authentication Applications:** Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), S/MIME.

Unit V : **IP Security:** Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

Web Security: Secure socket layer and transport layer security, secure electronic transaction (SET).

System Security: Intruders, Viruses and related threads, firewall design principals, trusted systems.

Text Book:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Prentice Hall, New Jersy.

Reference Book:

1. Johannes A. Buchmann, "Introduction to Cryptography", Springer-Verlag.
2. Bruce Schiener, "Applied Cryptography".

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **DATAWAREHOUSE & DATA MINING**	Course Code: **DA7030**		
Credit: **3.5**	L	T	P
	3	**1**	**0**
Year: **4th**	Semester: **VII**		

Unit I : Overview, Motivation (for Data Mining), Data Mining-Definition & Functionalities.

Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting. ROLAP, MOLAP, HOLAP.

Unit II : **Data Pre-Processing**: Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Inconsistent Data, Data Integration and Transformation.

Data Reduction: Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation.

Unit III : **Concept Description:** Definition, Data Generalization, Analytical Characterization,

Analysis of attribute relevance, Mining Class comparisions, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases

Unit IV : **Classification:** What is Classification, Issues regarding Classification, Decision tree, Bayesian Classification, Classification by Back propagation.

Unit V : **Cluster Analysis:** Data types in cluster analysis, Partitioning methods. Hierarchical Clustering-CURE and Chameleon, Density Based Methods-DBSCAN, OPTICS, Grid Based Methods- STING, CLIQUE, Outlier Analysis

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Text Book:

1. Jiawei Han, Micheline Kamber, ”Data Mining Concepts & Techniques” Elsevier

Reference Book:

1. M.H.Dunham,”Data Mining:Introductory and Advanced Topics” Pearson Education
   Mallach,”Data Warehousing System”,McGraw –Hill

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **Cloud Application development & Storage Virtualization**	Course Code: **DA7660**
Credit: **4**	L **3** T **0** P **2**
Year: **4th**	Semester: **VII**

Unit I

Cloud Deployment: Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages

Application Development: Google App Engine, Introduction to google app engine, using google app engine with Eclipse IDE, Develop a single basic application with google app engine, deploy application over google cloud.

Microsoft Azure- Introduction, develop a Cloud asp.net application, deploy on Azure Cloud.
Amazon Web Services- Amazon EC2, Develop and deploy an application on Azure cloud

Unit II

Virtualization: What is virtualization? Tools providing virtualization- VMware, VirutalBox, Advantages and disadvantages of Virtualization, Setting up virtual machine- Linux installation as a server, Setup client-server environment.

Unit III

Virtualized Data Center Architecture: Cloud infrastructures; public, private, hybrid. Service provider interfaces; Saas, Paas, Iaas. VDC environments; concept, planning and design, business continuity and disaster recovery principles. Managing VDC and cloud environments and infrastructures.

Unit IV

Storage Network Design: Architecture of storage, analysis and planning. Storage network design considerations; NAS and FC SANs, hybrid storage networking technologies (iSCSI, FCIP, FCoE), design for storage virtualization in cloud computing, host system design considerations.

Unit V

Cloud Optimized Storage: Global storage management locations, scalability, and operational efficiency. Global storage distribution; terabytes to petabytes and greater. Policy based information management; metadata attitudes; file systems or object storage.

Text Book:

1- Lars Nielsen, "The Little Book of Cloud Computing", New Street Communications by LLC (January 4, 2013).

Reference Book:

1. John Rhoton, "Cloud Computing Explained" by Recursive Press 2nd edition (November 2, 2009).

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **STATISTICAL MACHINE LEARNING**	Course Code: **DA7670**
Credit: **4**	L: **3** T: **0** P: **2**
Year: **4th**	Semester: **VII**

Unit I **Introduction:** Probability Theory, Overview of supervised learning, Curse of dimensionality, Decision theory, Information theory, Minimax theory, Parametric versus non-Parametric methods, Bayesian versus non-Bayesian approaches, Classification, Regression, Density estimation, Bias-variance, Lasso, MLE.

Unit II **Parametric and Nonparametric Methods:** Linear regression, Model selection, Generalized linear models, Classification, Structured prediction, Hidden Markov models; Regression: Linear smoothers, Variance estimations, Confidence bands, Average coverage, Space-scale smoothing, Multiple regression; Density estimation: Cross-validation, Histograms, Kernel density estimation, Local polynomials, Classification, Bootstrap and sub-sampling, Nonparametric Bayes.

Unit III **Kernel Methods and Machines:** Dual representations, Kernel construction, Selecting the width of the kernel, Kernel density estimation and classification, Radial basis functions and kernel, Gaussian processes, Maximum margin classifiers, Relevance vector machines.

Unit IV **Graphical and Mixture Models:** Bayesian networks: Generative models, Linear-Gaussian models; Conditional independence: D-separation; Markov random fields: Factorization properties, Relation to directed graphs; Inference in graphical models: Inference on a chain, Trees, Factor graphs, Sum-product & max-sum properties, Loopy belief propagation; K-means clustering, Mixtures of Gaussians, EM, An alternative view of EM.

Unit V **Other Learning Methods:** Unsupervised learning, Semi-supervised learning, Reinforcement learning, Ensemble learning, Online learning, Active learning.

Text Book

1. Bishop C. M., Pattern Recognition and Machine Learning, Springer (2006), 1st ed.
2. Hastie T., Tibshirani R., Friedman J., The Elements of Statistical Learning, Springer (2008), 2nd ed.

Reference Book

1. Wasserman L., All of Statistics: A Concise Course in Statistical Inference, Springer (2010), 1st ed.
2. Devroye L., Gyorfi L., Lugosi G., A Probabilistic Theory of Pattern Recognition, Springer, (1996), 1st ed.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **GAME ENGINE ARCHITECTURE**	Course Code: **DA7630**		
	L	T	P
Credit: **4**	**3**	**0**	**2**
Year: **4th**	Semester: **VII**		

Unit I **Foundations:** Introduction to gaming, Game Engine, Engine Differences Across Genres, Game Engine Survey, Runtime Engine Architecture, Tools and the Asset Pipeline, Profiling Tools, Version Control, Memory Leak and Corruption Detection, Fundamentals of Software Engineering for Games.

Math for Games: Solving 3D Problems in 2D, Points and Vectors, Matrices, Quaternion's, Comparison of Rotational Representations, Other Useful Mathematical Objects, Hardware-Accelerated SIMD Math, Random Number Generation.

Unit II **Low-Level Engine Systems:** Engine Support Systems, Subsystem Start-Up and Shut-Down, Memory Management, Containers, Strings, Engine configuration.

Resources and the File System: File System, Resource Manager, Game Loop and Real-Time Simulation, Rendering Loop, Game Loop Architectural Styles, Abstract Timelines, Measuring and Dealing with Time, Multiprocessor Game Loops, Networked Multiplayer Game Loops.

Unit III **Human Interface Devices (HID):** Types of Human Interface Devices, Interfacing with a HID, Types of Inputs, Types of Outputs, Game Engine HID Systems, Human Interface Devices in Practice.

Graphics and Motion: Rendering Engine, Foundations of Depth-Buffered, Triangle Rasterization, the Rendering Pipeline, Advanced Lighting and Global Illumination, Visual Effects and Overlays.

Unit IV **Animation Systems:** Types of Character Animation, Skeletons 496x Contents, Poses, Clips, Skinning and Matrix Palette Generation, Animation Blending, Post-Processing, Compression Techniques, Animation System Architecture, The Animation Pipeline, Action State Machines, Animation Controllers.

Unit V **Collision and Rigid Body Dynamics:** Collision/Physics Middleware, The Collision Detection System, Rigid Body Dynamics, Integrating a Physics Engine into Game, Advanced Physics Features.

Text Books:

1. Jason Gregory, Jeff Lander and Matt Whiting, Game Engine Architecture, A K Peters/CRC Press; 2 edition (May 26, 2014)
2. Allen Sherrod, Ultimate 3D Game Engine Design & Architecture, Charles River Media game development (August 24, 2009)

Reference Books:

1. Alan Thorn,**Game Engine Design and Implementation, Jones & Bartlett Learning (June 30, 2010)**

2. Luke Ahearn, 3D Game Textures, Focal Press, Third Edition, October 17, 2011
3. Heather Maxwell Chandler, Game Production Handbook, Jones & Bartlett, 2013, 3rd ed.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **DIGITAL IMAGE PROCESSING**	Course Code: **DA7640**
Credit: **4**	L: **3** T: **0** P: **2**
Year: **4th**	Semester: **VII**

Unit I : **Introduction and Fundamentals:** Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.
Image Enhancement in Spatial Domain: Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

Unit II : **Image Enhancement in Frequency Domain:** Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.
Image Restoration: A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

Unit III : **Color Image Processing:** Color Fundamentals, Color Models, Converting Colors to different models, Color Transformation, Smoothing and Sharpening, Color Segmentation.
Morphological Image Processing: Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening.

Unit IV : **Registration:** Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth
Segmentation: Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Regionbased Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

Unit V : **Feature Extraction:** Representation, Topological Attributes, Geometric Attributes.
Description: Boundary-based Description, Region-based Description, Relationship.
Object Recognition: Deterministic Methods, Clustering, Statistical Classification, Syntactic Recognition, Tree Search, Graph Matching.

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Text Book:

Rafael C. Gonzalvez and Richard E.Woods., Digital Image Processing 2nd Edition, Pearson Education.
2. R.J. Schalkoff. ,Digital Image Processing and Computer Vision, John Wiley and Sons, NY.

Reference Book:

1. A.K. Jain. , Fundamentals of Digital Image Processing, Prentice Hall, Upper Saddle River, NJ.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **ADVANCED COMPUTER NETWORK**	Course Code: **DA7650**
Credit: **4**	L: **3** T: **0** P: **2**
Year: **4th**	Semester: **VII**

UNIT I ***(8L)***

Network Design: Design Principles, Determining Requirements, Analysing the Existing Network, Preparing the Preliminary Design, Completing the Final Design Development, Deploying the Network, Monitoring and Redesigning, Maintaining, Design Documentation, Cisco PDIOO Model, Modular Network Design, Hierarchical Network Design, The Cisco Enterprise Composite Network Model.

UNIT II ***(8L)***

Router Design: Configuring a Router, Routing Protocols, **Switching Design**: Switching Types, Layer 2 and 3 Switching, Multilayer Switching, Cisco Express Forwarding, Switching Security, Multi-Protocol Label Switching (MPLS), MPLS Architecture and related protocols. **IPv4 Routing Design**: IPv4 Address Design, Private and Public Addresses ,NAT, Subnet Masks, Hierarchical IP Address Design, Deploying IPv6 in Campus Networks,

UNIT III ***(8L)***

Wireless LAN Design: Wireless Technology Overview, Wireless Standards, Wireless Components, Wireless Security, Wireless Security Issues, Wireless Threat Mitigation, Wireless Management, Wireless Design Considerations, IEEE 802.11, Wireless Standard, Cellular Networks, Mobile IP, Wireless Mesh Networks(WMNs), QoS Models: IntServ, DiffServ154, QoS Tools, Policing and Shaping, Congestion Avoidance, Congestion Management, Link- Specific Tools, QoS Design Guidelines.

UNIT IV ***(8L)***

Optical Networks: Benefits of Optical Networks, Optical Network Drivers, Component Applications, Design and Planning, Restoration, Network Management, WDM System, All-Optical Network, Optical Layer Services and Interfacing.

NIT V ***(8L)***

Network Security and Management Design: Hacking: Vulnerabilities, Threats: Reconnaissance Attacks, Access Attacks, Information Disclosure Attacks, Denial of Service Attacks, Threat Defence Secure Communication, Network Security Best Practices, SAFE Campus Design.

ISO Network Management Standard: Protocols and Tools, SNMP, MIB, RMON, Cisco NetFlow, Syslog, Network Management Strategy: SLCs and SLAs, IP Service-Level Agreements, Content Networking Design.

Text Book:

1. Diane Tiare and Catherine Paquet, "Campus Network Design Fundamentals", Pearson Education, 2006.
2. Rajiv Ramaswami, Kumar N Sivarajan, Galen H Sasaki, "Optical Networks, A Practical Perspective", 3rd Edition, Elsevier, 2010.

Reference Book:

1. Craig Zacker, "The Complete Reference: Upgrading and Troubleshooting Networks", Tata McGraw-Hill, 2000.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **BUSINESS INTELLIGENCE**	Course Code: **DA8010**
Credit: **3.5**	L T P **3 1 0**
Year: **4th**	Semester: **VIII**

Unit I

Introduction to Business Intelligence,

Introduction to OLTP and OLAP, BI Definitions & Concepts, Business Applications of BI, BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities

Unit II

Basics of Data Integration (**E**xtraction **T**ransformation **L**oading)**,**

Concepts of data integration need and advantages of using data integration, introduction to common data integration approaches, introduction to ETL using SSIS, Introduction to data quality, data profiling concepts and application

Unit III

Introduction to Multi-Dimensional Data Modeling**,**

Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi dimensional modeling, concepts of dimensions, facts, cubes, attribute, hierarchies,

Unit IV

Star and snowflake schema, introduction to business metrics and KPIs, creating cubes using SSAS

Unit V

Basics of Enterprise Reporting**,**

Introduction to enterprise reporting, concepts of dashboards, balanced scorecards, introduction to SSRS Architecture, enterprise reporting using SSRS

Text Book:

1. David Loshin ,Business Intelligence.
2. Mike Biere ,Business intelligence for the enterprise .
3. Larissa Terpeluk Moss, Shaku Atre ,Business intelligence roadmap.

Reference Book:

1. Cindi Howson ,Successful Business Intelligence: Secrets to making Killer BI Applications .
2. Brain, Larson ,Delivering business intelligence with Microsoft SQL server 2008 .

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **REAL TIME SYSTEMS**	Course Code: **DA8040**
Credit: **3.5**	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VIII**

UNIT-I: Introduction
Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

UNIT-II: Real Time Scheduling
Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III: Resources Access Control
Effect of Resource Contention and Resource Access Control (RAC), Nonpreemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

UNIT-IV: Real Time Communication
Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols

UNIT-V: Real Time Operating Systems and Databases
Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases

Text Book:
1. Jane W. S. Liu, "Real Time Systems", Pearson Education Publication.
2. Albert M. K. Cheng, "Real-Time Systems: Scheduling, Analysis, and Verification ,John Wiley and Sons Publications.
Reference Book:
1. Mall Rajib," Real Time Systems" Pearson Education

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **CYBER LAW & IPR**	Course Code: **DA8050**		
	L	T	P
Credit: **3.5**	**3**	**1**	**0**
Year: **4th**	Semester: **VIII**		

UNIT I - FUNDAMENTALS OF CYBER SECURITY

Introduction-Cyber Security and its problem-Intervention Strategies: Redundancy, Diversity and Autarchy.

UNIT II – ISSUES IN CYBER SECURITY

Private ordering solutions, Regulation and Jurisdiction for global Cyber security, Copy Right-source of risks, Pirates, Internet Infringement, Fair Use, postings, criminal liability, First Amendments, Data Loss.

UNIT III – INTELLECTUAL PROPERTY RIGHTS

Copy Right-Source of risks, Pirates, Internet Infringement, Fair Use, postings, Criminal Liability, First Amendments, Losing Data, Trademarks, Defamation, Privacy-Common Law Privacy, Constitutional law, Federal Statutes, Anonymity, Technology expanding privacy rights.

UNIT IV - PROCEDURAL ISSUES

Duty of Care, Criminal Liability, Procedural issues, Electronic Contracts & Digital Signatures, Misappropriation of information, Civil Rights, Tax, Evidence.

UNIT V-LEGAL ASPECTS OF CYBER SECURITY

Ethics, Legal Developments, Late 1990 to 2000,Cyber security in Society, Security in cyber laws case. studies, General law and Cyber Law-a Swift Analysis.

Text Book:

1. Jonathan Rosenoer,*"Cyber Law: The law of the Internet"*, Springer-Verlag,1997.

Reference Book:

1. Mark F Grady, Fransesco Parisi, "*The Law and Economics of Cyber Security"*, Cambridge University Press, 2006.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **SECURITY IN CLOUD COMPUTING**	Course Code: **DA8660**
Credit: **3**	L: **3** T: **0** P: **0**
Year: **4th**	Semester: **VIII**

Unit I

Security concepts: Confidentiality, privacy, integrity, authentication, non-repudiation, availability, access control, defence in depth, least privilege, how these concepts apply in the cloud, what these concepts mean and their importance in PaaS, IaaS and SaaS. e.g. User authentication in the cloud; Cryptographic Systems- Symmetric cryptography, stream ciphers, block ciphers, modes of operation, public-key cryptography, hashing, digital signatures, public-key infrastructures, key management, X.509 certificates, OpenSSL.

Unit II

Information Storage Security & Design: Storage strategy and governance; security and regulations. Designing secure solutions; the considerations and implementations involved. Securing storage in virtualized and cloud environments. Monitoring and management; security auditing and SIEM.

Unit III

Information Availability Design: Designing backup/recovery solutions to guarantee data availability in a virtualized environment. Design a replication solution, local remote and advanced. Investigate Replication in NAS and SAN environments. Data archiving solutions; analyzing compliance and archiving design considerations.

Unit IV

Virtualization system-specific attacks: Guest hopping, attacks on the VM (delete the VM, attack on the control of the VM, code or file injection into the virtualized file structure), VM migration attack, hyper jacking.

Unit V

Legal and compliance issues: Responsibility, ownership of data, right to penetration test, local law where data is held, examination of modern Security Standards (eg: PCIDSS), how standards deal with cloud services and virtualization, compliance for the cloud provider vs. compliance for the customer.

Text Book:

1- David Sarna, "Implementing and developing cloud computing applications" by Shroff Publishers.

2- Greg Schulz, "Cloud and Virtual Data Storage Networking" by Auerbach Publications August 26, 2011

Reference Book:

1. Daniele casal, "Cloud Computing for Programmers".
2. Vaughn Stewart, "Virtualization Changes Everything: Storage Strategies for VMware vSphere & Cloud Computing" by CreateSpace Independent Publishing Platform (August 12, 2012).

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **MACHINE LEARNING & NEURAL NETWORKS**	Course Code: **DA8670**
Credit: **3**	L: **3** T: **0** P: **0**
Year: **4th**	Semester: **VIII**

Unit I **Introduction:** Well-Posed learning problems, Basic concepts, Designing a learning system, Issues in machine learning. Types of machine learning: Learning associations, Supervised learning (Classification and Regression Trees, Support vector machines), Unsupervised learning (Clustering), Instance-based learning (K-nearest Neighbor, Locally weighted regression, Radial Basis Function), Reinforcement learning (Learning Task, Q-learning, Value function approximation, Temporal difference learning).

Unit II **Decision Tree Learning:** Decision tree representation, appropriate problems for decision tree learning, Univariate Trees (Classification and Regression), Multivariate Trees, Basic Decision Tree Learning algorithms, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

Unit III **Artificial Neural Network:** Perceptron learning, Pattern Classification. Hebb Rule. Adaline. Madaline. Delta Rule. Perceptron, Training a perceptron, Multilayer perceptron, Back propagation learning, Competitive learning, Hebbian learning, BAMs.

Unit IV **Supervised and Unsupervised learning**: Supervised and Unsupervised learning Reinforcement learning, Kohonen Self Organizing Maps, Adaptive Resonance Theory, Neural Network Applications. Recurrent Networks, Dynamically modifying network structure, .Support Vector Machines

Unit V **Inductive and Analytical Learning:** Learning rule sets, Comparison between inductive and analytical learning, Analytical learning with perfect domain theories: Prolog-EBG. Inductive-Analytical approaches to learning, Using prior knowledge to initialize hypothesis (KBANN Algorithm), to alter search objective (TangentProp and EBNN Algorithm), to augment search operators (FOCL Algorithm).

Text Book

1. Mitchell T.M., Machine Learning, McGraw Hill (1997) 2nd ed.
2. Alpaydin E., Introduction to Machine Learning, MIT Press (2010) 2nd ed.

Reference Book

1. 1. Bishop C., Pattern Recognition and Machine Learning, Springer-Verlag (2006) 2nd ed.

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **COMPUTER ANIMATION**	Course Code: **DA8640**
Credit: **3**	L T P **3 0 0**
Year: **4th**	Semester: **VIII**

Unit I **Introduction:** Digital Environment, Development of Technology, Visual Milestones, Timeline Charts, Storytelling, Character Design, Visual & Look Development, Production Strategies & Process of Computer Animation, Computer Animation Studio, Creative & Production Teams.

Unit II **Modelling:** Space, Objects, and Structures, Building with Numbers, Vertices, Edges, and Facets, Moving Things Around, File Formats for Modelling, Curved Lines, Geometric Primitives, Sweeping, Free-Form Objects and Curved Surfaces, Modelling Utilities, Real-Time Polygonal Models, Splines, Subdivision Surfaces, Logical Operators and Trimmed Surfaces, Procedural Descriptions and Physical Simulations, Photogrammetry and Image-Based Modelling, Animation Rigging and Hierarchical Structures.

Rendering: Lights, Camera, and Materials, Color Theory; Steps in the Rendering Process; Hidden Surface Removal, Z-Buffer, Ray Tracing, Global Illumination and Radiosity, Image-Based, Non-Photorealistic, Hardware Rendering, File Formats for Rendered Images.

Unit III **Lighting and Shading:** Types of Cameras, Lenses, The Pyramid of Vision, Types of Camera Shots, Lighting Strategies and Mood, Basic Components and types of a Light Source, Lighting the Scene, Basic Positions of Light Sources; Surface Shading Techniques, Surface Shaders and Multi-Pass Rendering, Shadowing, Image Mapping, Surface Reflectivity, Surface Color, Texture and Transparency, Environment-Dependent Shading, Selected Rendering Hacks.

Unit IV **Animation and Effects:** The Craft of Animation, The Twelve Principles, Character Development, Storyboarding; Basic Introduction of: Keyframe Interpolation, Parameter Curves, Forward & Inverse Kinetics, Model, Camera, Light and Hierarchical Character Animation, 2-D, 3-D Integration, Animation File Formats, Performance Animation, Motion Capture, Motion Dynamics, Fluid Simulation, Procedural, Facial and Crowd Animation, Location-Based and Interactive Entertainment, Rotoscoping, Blue and Green Screens and Chroma Keys, Set and Character Extensions, Three-Dimensional Morphing, Motion Capture and Control, Practical Effects.

Unit V **Post-Processing:** Retouching, Compositing, and Color Grading, Image Resolution and Output: Basic Concepts of Digital Output, Image Resolution, Image File Formats and Aspect Ratios, Output on Paper, Photographic Media, Video, Digital Media, Three-Dimensional Media.

Text Book

1. Isaac Kerlow, "The Art of 3D Computer Animation and Effects", 4th edition, Wiley, 2009.
2. Park J. E., "Understanding 3D Animation Using Maya", 1st edition, Springer, 2005.

Reference Book

1. Jones A., Oliff J., "Thinking Animation: Bridging the Gap Between 2D and CG", 1st edition, Cengage Learning, 2006

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **COMPUTER VISION**	Course Code: **DA8630**		
Credit: **3**	L	T	P
	3	**0**	**0**
Year: **4th**	Semester: **VIII**		

Unit I

Introduction: What is computer vision, The Marr paradigm and scene reconstruction, Other paradigms for image analysis. Image Formation, Image Geometry, Radiometry, Digitization.

Unit II

Binary Image Analysis and Segmentation: Properties, Digital Geometry, Segmentation.

Unit III

Image Processing for Feature Detection and Image Synthesis, Edge detection, corner detection Line and curve detection, SIFT operator, Image-based modelling and rendering, Mosaics, snakes.

Unit IV

Stereo: Shape from shading, Photometric stereo, Texture, Occluding contour detection, Motion Analysis: Motion detection and optical flow Structure from motion

Unit V

Object recognition: Hough transforms and other simple object recognition methods, Shape correspondence and shape matching ,Principal component analysis ,Shape priors for recognition

Text Book:

1. D. Forsyth and J. Ponce, *Computer Vision - A modern approach*, Prentice Hall *Robot Vision*, by B. K. P. Horn, McGraw-Hill.

Reference Book:

1. E. Trucco and A. Verri *,Introductory Techniques for 3D Computer Vision*, Publisher: Prentice Hall

Department of Computer Science & Engineering
Course Structure for B.Tech. (CSE)
Batch: 2016-20

Course Title: **SOFTWARE TESTING**		Course Code: **DA8650**	
Credit: **3**	L	T	P
	3	**0**	**0**
Year: **4th**		Semester: **VIII**	

Unit I **(8 L)**

Introduction: Terminology, evolving nature of area, Errors, Faults and Failures, Correctness and reliability, Testing and debugging, Static and dynamic testing, Exhaustive testing: Theoretical foundations: impracticality of testing all data, impracticality of testing all paths, no absolute proof of correctness.

Unit II **(8 L)**

Software V & V Approaches and their Applicability: Software technical reviews; Testing techniques and their applicability -functional testing and analysis, structural testing and analysis, error-oriented testing and analysis, hybrid approaches, integration strategies, transaction flow analysis, stress analysis, failure analysis, concurrency analysis, performance analysis; Proof of correctness; simulation and prototyping; Requirement tracing.

Unit III **(8 L)**

Software Testing: Levels of Testing, Functional Testing, Structural Testing, Test Plan, Test Case Specification, Software Testing Strategies, Verification & Validation, Unit, Integration Testing, Top Down and Bottom Up Integration Testing, Regression and Stress Testing , Alpha & Beta Testing, White box and black box testing techniques, System Testing and Debugging.

Unit IV **(8 L)**

Test Generation: Test generations from requirements, Test generation pats, Data flow analysis, Finite State Machines models for flow analysis, Regular expressions based testing, Test Selection, Minimizations and Prioritization, Regression Testing.

Unit V **(8 L)**

Program Mutation Testing: Introduction, Mutation and mutants, Mutation operators, Equivalent mutants, Fault detection using mutants, Types of mutants, Mutation operators for C and Java.

Text Book:

1. Boris Beizer, Software Testing Techniques, John Wiley & Dreamtech (2002).
2. William Perry, Effective Methods for Software Testing, John Wiley & Sons, Inc. (2006) 3rd ed.
3. Aditya P. Mathur, Foundations of Software Testing, Pearson Education (2008).

Reference Book:

1. Glenford J. Myers, The Art of Software Testing, Wiley India Pvt. Ltd 2nd edition (2006) 2nd ed.
2. Roger S. Pressman, Software Engineering, A Practitioner's Approach, McGrawHill International Edition (2009) 7th edition.
3. Ian Sommerville, Software Engineering, Addison-Wesley Publishing Company, (2006) 8th ed.

Department of Computer Science & Engineering
Detailed Syllabus for B.Tech. (CSE-BDA)
Batch: 2016-20

DIT UNIVERSITY
Dehradun

Course Structure & Detailed Syllabus

of

B.Tech. in Computer Science & Engineering

Big Data & Analytics (IBM)

Batch 2016-20

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Big Data & Analytics
Batch: 2016-20

Year: 1st **Semester: I**

Course Code	Course Title	L	T	P	Credits
JA1010	Engineering Mathematics-I	3	1	0	3.5
OA1210	Engineering Physics	3	1	2	4.5
LA1210	Essentials of Mechanical Engineering	3	1	2	4.5
HA1210	Professional Communication-I	3	1	0	3.5
DK1210	Software Foundation & Programming using C	3	0	2	4
BA1010	Environmental Science	2	0	0	2
LA1220	Engineering Graphics	1	0	0	1
HA1310	Soft Skills Development	0	0	2	1
	Total				**24**

Year: 1st **Semester: II**

Course Code	Course Title	L	T	P	Credits
JA2010	Engineering Mathematics-II	3	1	0	3.5
BA1210	Engineering Chemistry	3	1	2	4.5
EA1210	Introduction to Electrical Engineering	3	1	2	4.5
FA1210	Introduction to Electronics & Communication	3	1	2	4.5
HA2210	Professional Communication-II	3	0	1	3.5
DK2210	Software Foundation & Programming using C++	3	0	2	4
LA1110	Workshop Practice	0	0	2	1
	Total				**25.5**

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Big Data & Analytics
Batch: 2016-20

Year: 2nd **Semester: III**

Course Code	Course Name	L	T	P	Credits
DA3210	Data Structures	3	0	2	4
DA3220	Computer Based Numerical and Statistical Techniques	3	0	2	4
DK3210	Essentials of OOP using Java	3	0	2	4
DA3010	Discrete Mathematics	3	1	0	3.5
DA3020	Computer Organization	3	1	0	3.5
FA3220	Digital System Design	3	1	2	4.5
	Total				**23.5**

Year: 2nd **Semester: IV**

Course Code	Course Name	L	T	P	Credits
DA4010	Theory of Computation	3	1	0	3.5
FA52A0	Microprocessors	3	1	2	4.5
DA4210	Computer Networks	3	0	2	4
DA4220	Web Technology	3	0	2	4
DK4250	Information Management Basics (T3)	3	0	2	4
DA4242	Linux Administration & Shell Programming	3	0	2	4
DL4110	Industry Session on Emerging Technology in Big Data & Analytics	0	0	2	1
DA4310	Value Addition Training	0	0	2	1
DA4410	Industrial Tour	0	0	2	1
	Total				**27**

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Big Data & Analytics
Batch: 2016-20

Year: 3rd **Semester: V**

Course Code	Course Name	L	T	P	Credits
JA5010	Probability & Random Variables	3	1	0	3.5
DA5020	Operating System	3	1	0	3.5
DA5210	Algorithms: Analysis & Design	3	0	2	4
DL5210	Trends in Business Intelligence	**3**	**0**	**2**	**4**
DA5230	Artificial Intelligence	3	0	2	4
HA5010	Principles of Management	2	0	0	2
DA5310	Aptitude Building – I	0	0	2	1
	Total				**22**

Year: 3rd **Semester: VI**

Course Code	Course Name	L	T	P	Credits
DA6210	Computer Graphics	3	0	2	4
DA6220	Dot Net Technologies	3	0	2	4
DA6230	Compiler Design	3	0	2	4
DK6050	Essentials of Software Engg. (OOAD & SW Lifecycle) (T3)	3	0	0	3
GC5010	Engineering Economics	2	1	0	2
	Elective -I	3	0	0	3
DK6210	Intelligent Systems	3	0	2	4
DA6310	Aptitude Building – II	0	0	2	1
DL6110	Project-GRM	0	0	4	2
	Total				**27**

After VI semester student will undergo minimum 6 weeks Industrial Training which will be evaluated in the VII semester.

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B.Tech. (CSE) with Specialization in Big Data & Analytics
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List of Elective Subjects for VI Semester

Elective – I	
DA6640	Mobile Computing
DA6650	Data Base Administration
DA6620	Genetic Algorithms & Probabilistic Reasoning

Year: 4th **Semester: VII**

Course Code	Course Name	L	T	P	Credits
DA7010	Distributed Computing	3	1	0	3.5
DA7020	Advanced Computer Architecture	3	1	0	3.5
DA7210	Cryptography and Network Security	3	0	2	4
DA7030	Data Warehousing and Mining	3	1	0	3.5
DL8210	**Data Science**	**3**	**0**	**2**	**4**
DL7210	Predictive Analysis Modeler	3	0	2	4
DA7510	Industrial Training and Presentation*	0	0	2	4
DK7250	Advanced RDBMS	3	0	2	4
DL7110	Project-GRM	0	0	4	2
	Total				**32.5**

Note: * The student shall undergo 'Industrial Training' during Summer Vacations and shall prepare the Report and Make a Presentation during this semester.

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Big Data & Analytics
Batch: 2016-20

Year: 4th **Semester: VIII**

Course Code	Course Name	L	T	P	Credits
DA8010	Business Intelligence	3	1	0	3.5
DA8040	Real Time Systems	3	1	0	3.5
DA8050	Cyber Law & IPR	3	0	0	3
	Elective – III	3	0	0	3
	Elective -II	3	0	2	4
	Open Elective	3	0	0	3
DL8110	**Project-GRM**	**0**	**0**	**8**	**4**
	Total				**24**

List of Elective Subjects for VIII Semester

Elective – II	
DA7640	Digital Image Processing
DA7650	Advanced Computer Networks
DA7670	Statistical Machine Learning
Elective – III	
DA8630	Computer Vision
DA8650	Software Testing
DA8670	Machine Learning & Neural Networks

List of Open Electives (To be conducted in VIII Semester)

Sl. No.	Branch	Subject Code	Name of Elective subjects
1	Physics	OA8710 OA8720	1. Nano Scale Science and Technology 2. Photonics Technology
2	EE	EA8710 EA8720	1. Non-Conventional Energy Resources 2. Instrumentation and Process control
3	ME	LA8710 LA8720	1. Entrepreneurship development 2. Quality Management
4	Civil	CA8710 CA8720	1. Environment and Ecology 2. GIS
5	CSE	**DA8740** DA8710	1. Management Information System (MIS) 2. Business Intelligence
6	IT	IA8730 IA8721	1. Internet of Things 2. IT In Business
7	ECE	FA8710	1. Consumer Electronics
8	Humanities	HA8710 HA8720	1. Industrial Psychology 2. Human Values and Ethics
9	MBA	GA8710 GA8730 GA8740	1. Organizational Behavior 2. Digital Marketing 3. Financial Modeling with Spread sheet

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Big Data & Analytics
Batch: 2016-20

Course Title: **Engineering Mathematics-I**	Course Code: **JA1010**
Credit: **3.5**	L: **3** T: **1** P: **0**
Year: **1st**	Semester: **I**

UNIT I: Differential Calculus-I [**9**]

Functions of single variable: Limit continuity and differentiability; Indeterminate forms; Mean value theorems; Role's Theorem; Taylor's theorem with remainders; Curve tracing.

UNIT II: Differential Calculus-II [**9**]

Successive differentiation; Leibnitz theorem; Partial differentiation; Euler's theorem; Expansion of functions of several variables; Extrema of functions of several variables; Lagrange's method of multipliers.

UNIT III: Integral Calculus [**9**]

Improper integral-Beta and Gamma functions; Double and Triple integrals; change of order of integration; change of variables; Dirichlet's integral and its applications; Application of multiple integral.

UNIT IV: Vector Calculus [**12**]

Vector Differentiation: Scalar and vector fields; gradient of scalar point function; directional derivatives; divergence and curl of vector point function; solenoidal and irrotational vectors.

Vector Integration: line, surface and volume integrals; Green's theorem; Stokes' theorem and Gauss divergence theorem (without proof).

Text Books:

- R. K. Jain & S. R. K. Iyenger, **Advanced Engineering Mathematics**, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.

Reference Books:

- E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, John &Wiley Sons, U.K., 2006.
- B. S. Grewal, **Higher Engineering Mathematics**, 42th Edition, Khanna publication, New Delhi, India, 2012.

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Big Data & Analytics
Batch: 2016-20

Course Title: **Engineering Physics**	Course Code: **OA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **I**

UNIT I:
Relativistic Mechanics: Inertial and Non-inertial Frames; Postulates of Special Theory of Relativity; Galilean and Lorentz Transformation; Length Contraction and Time Dilation; Addition of Velocities; Variation of Mass with Velocity and Mass Energy Equivalence.

UNIT II:
Interference: Introduction; Coherent Sources; Analytical treatment of interference; Young's double slit experiment and its analysis; Conditions of Interference; Fresnel's Biprism; fringes with white light; Determination of wavelength of monochromatic light by using Fresnel's Biprism method; Displacement of Fringes; Interference in plane parallel thin film (reflected and transmitted light) and wedge shaped film(reflected light only); Newton's Rings; Determination of wavelength of monochromatic light and determination of refractive index of a liquid by using Newton's ring method.

UNIT III:
Diffraction: Introduction; Difference between Interference and diffraction; resultant of superposition of n simple harmonic coherent vibrations; Fraunhofer diffraction due to single slit: resultant intensity; conditions of maxima; minima; angular and linear width of central maximum; Double slit diffraction: resultant intensity; missing order; N-slit diffraction : resultant intensity; conditions of maxima and minima; missing orders; angular width of principal maxima; Diffraction grating: formation of spectra and missing order spectra in spectrum; dispersive power of grating; Resolving power; Rayleigh Criterion of resolution; Resolving power of plane transmission diffraction grating.

UNIT IV:
Polarization: Polarised and unpolarised light and its pictorial representation; plane of polarisation and plane of vibration; Phenomenon of Double Refraction; positive and negative double refracting crystals; properties of ordinary and extra-ordinary Rays; Nicol Prism and its application as a polariser and analyser; Mathematical analysis of superposition of two linearly polarised light vectors; retardation plates – half wave plate and quarter wave plate; Production and detection of Plane; Circularly and Elliptically Polarized Light.
Laser: Spontaneous emission; stimulated emission and stimulated absorption; Einstein's A and B Coefficients and relation between them; Principle of Laser Action; Construction and Working of He-Ne; Semiconductor Laser.

UNIT V:
Wave Mechanics : Wave Particle Duality; de Broglie Concept of Matter Waves; Davisson and Germer experiment; Concept of wave packet; group and phase velocity; Heisenberg Uncertainty Principle and its applications viz. non existence of electron in nucleus; radius and energy of Bohr's first orbit; Schrödinger time independent and time dependent wave equation; Physical interpretation of wave function; Application of Schrodinger wave equation: Particle in a one dimensional box (eigen function and eigen values).
Introduction to Fibre Optics: Fundamental ideas about optical fiber; Types of fibers; Acceptance angle and cone; Numerical Aperture.

Text Books:

1. AjoyGhatak**; Optics;** Tata Mc-Graw Hill Education;2009.
2. Subramanyam; BrijLal;**A Text Book of Optics**; S. Chand, 2004.
3. K. Thyagarajan, AjoyGhatak; **Lasers: Fundamentals and Applications**; Second;Springer, 2010.
4. AjoyGhatak& K. Thyagarajan ;**Introduction to Fiber optics;**Cambridge University Press,1998.
5. Halliday, Resnick& Walker; **Principles of Physics**; Nineth, Wiley, India;2013

Reference Books:

1. Arthur Beiser ;**Concepts of Modern Physics**; Tata Mc-Graw Hill Education;2003.
2. Robert Resnick;**Introduction to Special theory of Relativity** ; First; John Wiley& Sons; 1968.
3. Jenkins and White ;**Fundamentals of Optics**; Fourth; McGraw-Hill;2001
4. David. J. Griffith; **An Introduction to Quantum Mechanics**;Second; Pearson prentice Hall; 2004.
5. Young and Freedman;**Sears and Zemansky's University Physics**,Tenth; Addison-Wesley, 2000.

List of Experiments

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help ofFresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locatethe position of cardinal points.
4. To determine the specific rotation of cane sugar solution using bi quartz polarimeter.
5. To determine the wavelength of spectral lines using plane transmissiongrating.
6. To determine the specific resistance of the material of given wire usingCarey Foster's bridge.
7. To determine the variation of magnetic field along the axis of a currentcarrying coil and then to estimate the radius of the coil.
8. To verify Stefan's Law by electrical method.
9. To calibrate the given ammeter using potentiometer.
10. To calibrate the give voltmeter using potentiometer.
11. To determine energy band gap of a given semiconductor material by p-n junction method.
12. To determine the viscosity of water by Poisseuille's method.

Note: Additional experiments may be added based on contents of syllabus.

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Big Data & Analytics
Batch: 2016-20

Course Title: **Essentials of Mechanical Engineering**	Course Code: **LA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **I**

UNIT – I **9L**

Introduction to Engineering: Difference between Science and Technology, history of wheel, introduction to prime movers, transmission system, belt, pulleys, gear system and nomenclature, braking system, Mechanism, lever mechanism, Working principle of power generation system, hydel power plant, thermal power plant and its main components.

Coplanar Force system: Resolution of force in two mutually perpendicular direction Free Body Diagram, Moment, Varignon's theorem, static equilibrium, Lami'sTheorem, type of joints/Support, Type of load: point load, uniformly constant and varying loads, beam and its type.

UNIT – 2 **7L**

Engineering material and their properties: Details of hook's law, Proportional limit, Yield point, Yield Stress, Engineering strain, Engineering stress, True stress and Strain, Plasticity, Elasticity, Allowable Strength, Hardness, Ductility, toughness, Fatigue, creep, strain energy, Impact Strength, Young modulus of Elasticity, Bulk Modulus, Poission Ration and its relation in between.

Stress and strain: Normal stress and strain, principle of Superposition, Deformation in stepped and composite bar.

UNIT – 3 **7L**

Thermodynamics: Macroscopic & microscopic study point of view, System, Surrounding and Universe, Phase, Property, State, Path, Process, Cyclic and non-cyclic processes, Quasi static process, Reversible and irreversible processes , Thermodynamic equilibrium, Concept of continuum, Energy and its forms, Enthalpy, Zeroth law, Different temperature scales and theory of temperature and Pressure measurement.

UNIT – 4 **8L**

Laws of Thermodynamics: Thermodynamic definition of work, Thermodynamic processes, Calculation of work in various processes and sign convention, Non-flow work and flow work, Joules' experiment, First law of thermodynamics, Internal energy and enthalpy, First law of thermodynamics applied to open systems, Steady flow energy equation and its applications, First law analysis for closed system (non flow processes), Limitations of first law of thermodynamics, PMM-I.

Statement of Second Law of Thermodynamics: Kelvin Planck's statement and Clausius statement and their equivalence.

UNIT – 5 **9L**

Power generation: Air standard cycle**,** IC Engine**,** Carnot cycle, Otto cycle, Diesel cycle, Important components of I.C.Engine, two stroke and four stoke engine, S.I. and C.I. engines, efficiency of Otto and diesel cycle

Basics of Heat Transfer: Concepts of the mechanisms of heat flows: conduction, convection and Radiation heat transfer application in engineering.

Reference Books:

1. Basu,A.R; A Text book of Engineering Mechanics(Applied Mechanics);2003 Edition; Dhanpat Rai & co.(p) Ltd, Delhi.
2. Chandramouli, P.N; Engineering Mechanics; Second Printing; PHI Learning Private Limited, Delhi; 2013.
3. Rajput, R. K; Material Science; S. K. Kataria & Sons, New Delhi.
4. Dubey, N. H; Engineering Mechanics, Statics and Dynamics; First reprint; McGraw Hill Education (India) Private Limited, New Delhi, 2013.
5. Ratan, S.S; Theory of machines; Second Edition; Tata McGraw Hill Publishing Company Limited, New Delhi.
6. Nag.P.K.; Engineering Thermodynamics; 3rd Edition; Tata McGraw Hill Publishing Company Limited, New Delhi.
7. Nag.P.K.; Heat and Mass Transfer; Tata McGraw Hill Publishing Company Limited, New Delhi.
8. Kumar.D.S; Basic of Mechanical Engineering; S. K. Kataria & Sons, New Delhi.

Essentials of Mechanical Engineering Lab

List of Experiments

1. Tensile test
2. Impact test
3. Hardness test
4. Pulley experiment
5. Experiment on conduction heat transfer
6. Demonstration of Impulse and reaction turbine
7. Study of 4s and 2S engine petrol Engine
8. Study of 4s and 2S engine Diesel Engine
9. Study of refrigerator and air conditioning

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Course Title: **Professional Communication – I**	Course Code: **HA1210**
Credit: **3.5**	L: **3** T: **1** P: **0**
Year: **1st**	Semester: **I**

UNIT 1: **COMMUNICATION** **(6 Hrs)**

1. Communication: Definition and Process of Communication.
2. Types of Communication: Formal and Informal Communication, Verbal and Non-Verbal Communication.
3. Barriers to Communication: Intrapersonal and Interpersonal Barriers. Semantic Barriers, Physical Barriers, Psychological Barriers, and Organizational Barriers.

UNIT 2: **LISTENING SKILLS & SPEAKING SKILLS** **(8 Hrs)**

1. Importance and Objective of Listening Skills, Process of Listening, Listening and Hearing, Types of Listening, and Methods for Improving Listening Skills
2. Listening Comprehension: Identifying General and Specific Information.
3. Listening for Note taking and drawing Inferences.
4. Importance of Speaking Skills, Types of Speaking, Methods for Improving Speaking Skills
5. Introduction to Phonetic Transcription: Familiarization with British and American Usage.

UNIT 3: **READING SKILLS** **(4 Hrs)**

1. Importance of Reading Skills, Types of Reading Skills, Methods of Improving Reading Skills.
2. Vocabulary Building: Antonyms, Synonyms, Homophones, Homonyms, and One-Word Substitution, Etymology and roots.

UNIT 4: **WRITING SKILLS** **(10 Hrs)**

1. Importance of Writing Skills, Types of Writing Skills, and Methods for Improving Writing Skills.
2. Sentence and Paragraph Construction. Writing Expository, Argumentative and Deductive Order etc Paragraphs.
3. Précis Writing
4. Basic Letter Writing: Format and Style of Formal Letters.

UNIT 5: **ONE ACT PLAY** **(6 Hrs)**

Practice of LRSW through the study of the one act play, ***THE REFUND*** by **Fritz Karinthy**.

TEXT BOOK

1. Gupta, Ruby. Basic Technical Communication, Cambridge University Press, New Delhi.2012.

REFERENCE BOOKS

1. Rizvi, Ashraf. Effective Technical Communication, McGraw Hill, New Delhi. 2005
2. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011
3. Tyagi, Kavita& Padma Misra. Basic Technical Communication, PHI, New Delhi. 2011
4. Lewis, Norman. Word Power Made Easy, W.R Goyal Pub. & Distributors.1995
5. Ford A, Ruther. Basic Communication Skills; Pearson Education, New Delhi.2013
6. Aslam, Mohammad. Introduction of English Phonetics and Phonology Cambridge.2003
7. Kameswari, Y. Successful Career Soft Skills and Business English, BS Publications, Hyderabad.2010
8. English Pronouncing Dictionary, Cambridge.2012
9. The Oxford Guide to Writing and Speaking. OUP, Delhi.2011

Professional Communication – I Lab

Lab 1	Neutralization of Mother Tongue Influence through manner of articulation
Lab 2	Common Errors in English and Indianisms.
Lab 3	Introduction to Speech Sounds – Practicing Vowel and Consonant sounds
Lab 4	Syllable, word stress, Sentence stress
Lab 5	Pause group, Intonation & Rhythm
Lab 6	Functional English
Lab 7 & 8	Everyday Conversation : Greetings, Apologies, Requests, At a Restaurant, Shopping, Groceries, Hiring an Apartment, Travel Courses, etc.
Lab 9	Developing Listening skills through cultural movies
Lab 10 &11	Movie - To provide exposure to the target language
Lab 12	Final evaluation based on Extempore

References: (Software and Videos)

1. Wordsworth English Language laboratory software
2. Wordsworth Prep 1-2-3
3. Connected Speech Level 1-2-3
4. Learn To speak English CD 1-2-3-

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Course Name	**IBM CE - Software Foundation Course with C Programming**
Course Code	RATSWF3BIN **/ DK1210**
About Technology	Software is the invisible thread that exists today in all systems that we see or experience, be it while travelling, shopping, banking, connecting with friends or performing any other routine task. Software not only integrates information, empowers people, connects global ecosystems, and optimizes business processes but, also brings business, people, and the world together. The open source technologies and concepts form the conceptual foundation of current day software development platforms.
About Course	This course provides conceptual and foundational knowledge of the Fundamentals of technologies in the context of software and programming. The contents of this course will ensure a student's interest in the subject is well founded and sows a seed for a conceptual understanding of History of Computing, including programming and the Open Source concepts. The course includes enough hands on exercises for the students to be glued on to it.
Target Audience	The Software Foundation course enables students in early stages of undergraduate studies who want to make a career in Information Technology industry. Students of: – CS/IT/ECE/EEE Engineering - 1st / 2nd Year – BCA/ BSC – 1st / 2nd year
Pre-requisites	No previous Software knowledge, other than basic computer/Windows usage required.
Contents	Brief History of Computing Art and Science of Programming Introduction to C Programming - Background of C - Getting Started with C - Constructs, Loops & Arrays - Functions - Pointers - User Defined Types - Binary I/O With Structures - Appendix. Reference Tables Open Standards, Open Source, and IBM - What is an Open Standard - Open Standards Model - Industries needing standards - The Impact of Standards - Open Source Software - Open Source - Open Source Technology - The OPEN Proposition Introduction to Linux - What is Linux - Background of Linux - Why is Linux so popular - What can you do with Linux - Linux Distributions - Linux Technology Center - Future of Linux PHP - What is PHP - PHP – Key Driver of LAMP Stack - Getting Started with PHP

- Unified ODBC
- PHP Data Objects
- PHP Deployment Platform
- What is Zend Core
- Features and Benefits
- Zend and IBM
- What is Ruby
- What is Rails

Applicable Prometric Certification - NA -

Follow on courses

- IBM CE - Software Foundation (Advanced) Course with C++ Programming
- IBM CE Minor Projects
- IBM CE – Introduction to Object -Oriented Programming using Java
- IBM CE - Basics of Information Management with DB2
- IBM CE - Basics of IBM Rational Rhapsody
- IBM CE - Introduction to Cloud Computing

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Course Title: **Environmental Science**	Course Code: **BA1010**
Credit: **2**	L: **2** T: **0** P: **0**
Year: **1st**	Semester: **I**

Unit – 1 **(6L)**

Natural Resources: Renewable and non-renewable resources

Definition, scope, importance and need for public awareness, natural resources and associated problems.

- Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
- Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
- Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture and green revolution, water logging, salinity.
- Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources.
- Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Unit – 2 **(5L)**

Ecosystems

Concept, Structure and function of an ecosystem, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the Forest and aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit – 3 **(5L)**

Biodiversity and its conservation

Introduction – Definition: genetic, species and ecosystem diversity. Bio geographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-sports of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit – 4 **(6L)**

Environmental Pollution

Definition, Cause, effects and control measures of:-

a. Air pollution b. Water pollution c. Soil pollution
d. Marine pollution e. Noise pollution f. Thermal pollution
g. Nuclear hazards

• Solid waste Management and biomedical waste: Causes, effects and control
• Role of an individual in prevention of pollution.
• Pollution effects-global warming, acid rain, ozone depletion, smog and case studies.
• Disaster management: floods, earthquake, cyclone and landslides.

Unit – 5 **(6L)**

Social Issues and the Environment

- From Unsustainable to Sustainable development
- Water conservation, rain water harvesting, watershed management
- Environmental Impact Assessment and Resettlement and rehabilitation problems.
- Climate change
- Wetland conservation.
- Role of remote sensing and GIS in environmental monitoring and analysis
- Environment Protection Act. 1986
- Air (Prevention and Control of Pollution) Act. 1981
- Water (Prevention and control of Pollution) Act 1974
- Wildlife Protection Act 1972
- Forest Conservation Act 1980.

Field work:

- Visit to a local area to document environmental assets river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

REFERENCE BOOKS:

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad –380 013, India, Email:mapin@icenet.net (R)
2. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
3. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
4. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
5. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
6. Gleick, H.P. 1993. Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
7. Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
8. Mckinney, M.L. & School, R.M. 1996. Environmental Science Systems & Solutions, Web enhanced edition. 639p.
9. AnubhaKaushik&Kaushik, C.P. 2009.Perspectives in Environmental Studies, New Age International Publishers.
10. Manahan. S.E., Environmental chemistry, 9th edition.

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Course Title: **Engineering Graphics**	Course Code: **LA1220**
Credit: 1	L: **1** T: **0** P: **0**
Year: **1st**	Semester: **I**

UNIT – 1
Introduction: Sheet Layout, Types of Sheet, Size of Sheets, Title blocks, Type of lines, Lettering, Dimensioning, Scale (Full, Reduced, Large) Geometrical Constructions,

UNIT – 2
Projection: Methods of Projection, Planes of Projection, Projection of points, Projection of straight lines, Projection of auxiliary planes, Projection of planes.

UNIT – 3
Projection of solids, Sections of solids.

UNIT – 4
Development of surfaces

UNIT – 5
Isometric Projections

Reference Books:
1) Bhatt N. D. & Panchal V. M, "Engineering Drawing", Charotar Publisher, 2007.
2) Dhanjay A Jolhe, "Engineering Drawing" Tata McGraw Hill, 2008.
3) Gill P.S "Engineering Graphics" S. K. Kataria & Sons, 2009
4) John K.C, "Engineering Graphics" , 2nd edition, PHI Learning Pvt. Ltd., 2010

List of Experiments

1. Introduction to AutoCAD Commands, Explaining need of AUTO CAD over Manual drafting, Simple Drawings.
2. Sheet on Lettering and Geometric construction.
3. Orthographic Projections, Basic problem based on Projection of points.
4. Sheet on Projection of Lines.
5. Sheet on Projection of Planes.
6. Sheet on Projection of Auxiliary Planes.
7. Sheet on Projection of Solids.
8. Development of Surfaces.
9. Sheet on Isometric Projections from orthogonal views.

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Course Title: **Engineering Mathematics – II**	Course Code: **JA2010**
Credit: **3.5**	L **3** T **1** P **0**
Year: **1st**	Semester: **II**

UNIT I: **(10L)**

Linear Algebra

Matrices; Inverse of matrix; Echelon form; Rank of matrix; Consistency and solution of a system of linear equations; Linear dependence and independence of vectors; Matrix transformations; Eigen values and eigenvectors; Cayley– Hamilton theorem; Reduction to diagonal form; Vector spaces; Sub spaces; Basis; Dimension; Linear Transformation**.**

UNIT II: **(8L)**

Differential Equations

Linear differential equations first order and first degree; Linear differential Equations of higher orders with constant coefficients; Complementary functions and Particular integrals; Euler-Cauchy linear differential equations; Simultaneous linear differential equations; Method of variation of parameters.

UNIT III: **(6L)**

Infinite Series

Introduction; Sequences; Series; Convergence; Series of positive terms; Comparison test; Integral test; D'Alembert's Ratio test; Cauchy's root test; Alternating series; Leibnitz rule.

UNIT IV: **(8L)**

Fourier Series

Periodic functions; Fourier series of Periodic functions; Euler's formulae; Functions having arbitrary period; Change of intervals; Even and Odd functions; Half range sine and cosine series.

UNIT V: **(8L)**

Laplace Transform

Laplace Transform; Existence theorem; Properties of Laplace Transform ; Laplace Transform of derivatives and integrals; Laplace Transform of Periodic functions; Unit Step function and Error Function; Dirac- Delta function; Unit impulse function; Convolution theorem; Applications of Laplace Transform to solve linear and simultaneous differential equations.

Text Books:

1. R. K. Jain & S. R. K. Iyenger, **Advanced Engineering Mathematics**, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.
2. E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, John Wiley & Sons, U.K., 2006.

Reference Books:

1. W. E. Boyce and R. Di Prima, **Elementary Differential Equations**, (8th Edition), John Wiley & Sons, U.K., (2005).
2. B. S. Grewal, **Higher Engineering Mathematics**, 42nd Edition, Khanna Publication, New Delhi, India, 2012.

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Course Title: **Engineering Chemistry**			Course Code: **BA1210**
Credit: **4.5**	L **3**	T **1**	P **2**
Year: **1st**			Semester: **II**

UNIT – I

Water Chemistry

Introduction, Analysis of Water – Alkalinity, Chlorides and Dissolved Oxygen, Hardness of Water - Temporary and Permanent hardness, Estimation of hardness by EDTA Method, Disadvantages of Hard Water, Numerical problems.

Water for Industrial purpose – Boiler Feed Water, Boiler Troubles (Priming and Foaming, Boiler Corrosion, Scales and Sludges, Caustic Embrittlement), Water Treatment: Internal Treatment (Colloidal, Phosphate, Calgon, Carbonate Conditioning), External Treatment (Lime-Soda Process, Zeolite Process, Ion- Exchange Process), Numerical Problems.

UNIT – II

Physical Chemistry

Electrochemistry: Reference electrodes, Ion selective electrodes, Chemically modified electrodes as sensors, Electrochemical energy systems, Lithium batteries, Fuel cells.

Thermochemistry: Hess's Law, Heat of a reaction, Effect of temperature on heat of reaction at constant pressure (Kirchoff's eq.), Heat of dilution, Heat of hydration, Heat of neutralization and Heat of combustion.

Surface chemistry: Surface and interfacial tension, Capillary pressure.Adsorption phenonmenon, Adsorption of gaseson solids, Frendlich and Langmuir adsorption isotherms,Role of adsorbents in catalysis, ion-exchange and pollution abatement.

UNIT – III

Science of Corrosion and Protective Coatings

Introduction, Types of Corrosion, Theories of Corrosion and Mechanism, Factors Influencing Corrosion.Control of Corrosion.

Types of Protective Coatings: Metallic Coatings, Anodic Coatings, Galvanization, Cathodic Coatings, Tinning, Metal Cladding, Electroplating (Chromium Plating, Metal Spraying, Cementation-Sheradizing, Colourizing, Chromizing).

UNIT – IV

Introduction to Polymers and Nano-materials

Polymerization, Classification of polymers, Addition and Condensation Polymerizations. Plastics - Thermosetting and Thermoplastics. Preparation, Properties and Uses of Polyethylene, PVC, Teflon, Bakelite, Nylon, Polyester, Polyurethane, Ziegler-Natta catalyst, conducting polymers.Rubber- Processing of Natural Rubber, Vulcanization and Compounding. Elastomers: Buna-S, Buna- N, Thiokol.

Introduction to Nano-materials: Fullerenes, Nano-tubes, Nano-wires, Nano-cones, Nano-dots, Nano-sphere, Haeckelites. Their electronic and mechanical properties, Production methods for CNTs. Applications of nano materials in i) Medicine ii) Catalysis iii) Environmental Technologies iv) Electronics& related fields. v) Mechanics.

UNIT – V

Fuels & Lubricants

Fuels: Classification, crude oil: composition and fractionation, Octane & Cetane Number and their significance; calorific value of fuel, Determination of calorific value of fuels, bomb calorimeter, Solid fuels - Proximate and ultimate analysis, Numericals problems.

Lubricants: Functions of lubricants, Mechanism of Lubrication (thick film or hydrodynamic lubrication, thin film or boundary lubrication, extreme pressure lubrication), Classification and properties of lubricants- Viscosity, Flash and fire point, Cloud and pour point, Aniline point, Neutralization number and mechanical strength. Numerical problems on acid value and saponification value.

Text Books:

1. Chemistry in Engineering & Technology (Vol I & II) (Latest ed.) By J.C. Kuriacose& J. Rajaraman, Tata McGraw-Hill Co, New Delhi.
2. Engineering Chemistry by O.G. Palanna, Tata McGraw-Hill Co, New Delhi.

Reference Books:

1. Atkins' Physical Chemistry by Peter W. Atkins and Julio de Paula, Oxford University Press.
2. Principles of Physical Chemistry (Latest ed.) By Puri, Sharma & Pathania.
3. Organic chemistry, Morrison and Boyd, Pearson Prentice Hall, 2011
4. Environmental chemistry, S.E. Manahan, 9th edition, CRC Press.
5. Textbook of polymer science by F.W. Billmeyer, Wiley India.

Engineering Chemistry Lab

List of Experiments

1. Estimation of hardness of water by EDTA method
2. Estimation of total alkalinity in the given water sample.
3. Estimation of dissolved oxygen in the given water sample.
4. Estimation of available chlorine in the given sample of bleaching powder.
5. pH-metric titration.
6. Determination of viscosity of lubricants by Redwood viscometer / Ostwald's viscometer.
7. Determination Surface Tension of lubricants.
8. Determination of Flash point of a given oil by Pensky_Marten's flash point approach.
9. To Determine Saponification-value of the given Lubricating Oil.
10. To Determine Acid-Value of the given Lubricating Oil.
11. To determine the moisture, volatile and ash contents in a given coal sample by proximate analysis.
12. To study the adsorption of acetic acid on activated charcoal.

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Course Title: **Introduction to Electrical Engineering**			Course Code: **EA1210**
Credit: **4.5**	L **3**	T **1**	P **2**
Year: **1st**			Semester: **II**

UNIT – 1
D.C. NETWORK THEORY
Review of basic circuit theory concepts, Mesh and Nodal analysis, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Star–delta transformation, Magnetic Circuits.

UNIT – 2
A.C. CIRCUITS & MEASURING INSTRUMENTS
*Single Phase A.C.:*Phasor representation of voltage and current, A.C. circuit behavior of resistance, inductance, capacitance & their combination in series and parallel, Power triangle, Power factor, Concept of series & parallel resonance.
*Three Phase A.C.:*Star – delta connections, Relation between line and phase quantities, three phase power and its measurement, What is 3 phase 4 wire and 3 phase 5 wire system?
Measuring Instruments: Construction and principle of voltage and current measuring instruments.

UNIT – 3
TRANSFORMERS
Principle of operation, Types of construction, Phasor diagram, Equivalent circuit, Efficiency and voltage regulation of single phase transformer, O.C. and S.C. tests.

UNIT – 4
D.C. & SYNCHRONOUS MACHINES
D.C. Machines: Construction and working principle of d.c. generator and d.c. motor, Types of d.c. machines, E.M.F. equation, Torque equation, Magnetization and load characteristics, Losses and efficiency, Need of starter in d.c. motors.
Synchronous Machines: Construction and Principle of operation of Alternator and Synchronous Motor.

UNIT – 5
INDUCTION MOTORS
Three Phase Induction Motors: Principle of operation of 3-Ø induction motor, Types of 3-Ø induction motor, Need of starters in 3-Ø induction motors, Slip – torque characteristics,
Single Phase Induction Motor: Principle of operation of single phase induction motor, Methods of starting of single phase induction motor.

Reference Books:
1. V. Del Toro. " Principles of electrical Engineering, "Prentice hall International.
2. W.H. Hayt& J.E. Kemmerly," Engineering circuit Analysis, "McGraw Hill.
3. I. J. Nagrath, "Basic Electrical Engineering," Tata Mc. Graw Hill.
4. A. E. Fitgerald, D.E., Higginbotham and A Grabel, "Basic Electrical Engineering" McGraw Hill
5. H. Cotton, "Advanced Electrical Technology" Wheeler Publishing.

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Basic Electrical Engineering Lab

(Any Ten)

1. Verification of Network Theorems.
2. Study of diode characteristics. Study of phenomenon of resonance in RLC series circuit.
3. Measurement of power in a three phase circuit by two wattmeter method.
4. Measurement of efficiency of a single phase transformer by load test.
5. Determination of parameters and losses in a single phase transformer by OC and SC test.
6. Study of characteristic of DC Motor.
7. Study of characteristic of AC Motor.
8. DC generator characteristics.
9. 10. Speed control of dc shunt motor.
10. Study running and reversing of a three phase induction motor.
11. Study of a single phase energy meter.

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Course Title: **Introduction to Electronics & Communication**	Course Code: **FA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **II**

UNIT 1: Fundamental of Semiconductors ***10 L***

Energy bands in semiconductors, intrinsic and extrinsic semiconductors, Fermi Level in Intrinsic and Extrinsic semiconductor, Carrier transport in semiconductors: diffusion current, drift current, mobility, Hall Effect and resistivity. Generation and recombination of carriers.

UNIT 2: Application of Low Power and High Power Diodes ***10 L***

Diode circuits: Construction, Junction diode characteristics, Half and full wave rectifiers - Expression for efficiency and ripple factor - Bridge rectifier – π Filter circuits, Clipper, Clamper and multipliers using diodes, Zener Diode Characteristics - Regulated power supply using Zener diode.

UNIT 3: Transistor fundamentals ***8 L***

Transistor circuits: Characteristics of a transistor in CB, CE and CC modes - Relatively merits - Biasing of Transistors - Load Line and operating point concept (both AC and DC). Construction and working of JFET and MOSFET.

UNIT 4: Digital fundamentals and Introduction to Signals ***8 L***

Basic logic gates: AND, OR, and NOT – implementation of all gates using Universal gates, Number Systems conversions, Boolean algebra, K-map (upto 4 variables). Source of Information, Types of Signals.

UNIT 5: Basics of Communications & Instrumentation ***9 L***

Communication Systems, Communication Channels, Need of modulation, Types of modulations (Wave shapes and final expression only), Study of Piezoelectric, PMMC, LVDT and Strain Gauge transducers and their classifications and display device (7 segment) only.

Reference Books:

Unit 1. Electronics Devices and Circuits, Millman and Halkias, Tata McGraw Hill, 4th ed.
Unit 2 & 3. Electronic Devices and Circuit Theory, Robert L. Boylestad, Prentice Hall Higher Edu., 2000.
Unit 4. Digital Design, Morris Mano, PHI
Unit 4. Modern Digital & Analog Communications, B. P. Lathi, OUP
Unit 5. Electronic Communication Systems, John Kennedy , Tata McGraw Hill, 4th ed.
Unit 5. Electronic Instrumentation - H. S. Kalsi

ELECTRONICS ENGINEERING LAB.

1. To identify and Study of the various component and Devices of electronics with their specification (CRO, Function Generator, Multimeter, Power Supply, resistor, capacitor, inductor, ICs, LED, potentiometer etc.)
2. To study the V-I characteristics of PN diode and Zener diode.
3. To find the efficiency of Rectifiers and ripple factor of capacitive and non-capacitive half wave and full wave rectifier.
4. To Study and Verify clipper and clamper with biased circuits.
5. To find the characteristics of CB and CE amplifiers.
6. Determine the characteristics of FET.
7. To find out the power energy of various periodic and non periodic signals.
8. To verify the logic gates using diodes.
9. Study and observations of AM & FM Waveforms.
10. Study of various transducers (Strain Gauge).

***** *Plus 2-3 value added experiments can be performed.*

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Course Title: **Professional Communication – II**			Course Code: **HA2210**
Credit: **3.5**	L **3**	T **0**	P **1**
Year: **1st**			Semester: **II**

UNIT 1: **PROFESSIONAL COMMUNICATION** **(6 Hrs)**

1. Importance and Features of Business Communication, Flow and Channels of Communication in an Organization.
2. Introduction to Technical Communication, Types and History of Technical Communication.
3. Difference between General and Technical Communication, and Importance of Technical Communication.
4. Characteristic of Technical Communication, and Elements of Style.
5. Process of Preparing a Technical Document.
6. Elements and Features of Scientific Articles.
7. Compunication, E- mail, E- tools and Encyclopedia.

UNIT 2: **BUSINESS CORRESPONDENCE** **(8 Hrs)**

1. Business Correspondence – Principles, Features, Types, Format and Layout of Business Letter.
2. Inter Office Correspondence – Letters of Enquiry, Quotation, Order, Sales, and Complaint.
3. Intra Office Correspondence: Notice, Agenda, Minutes, and Memorandum.
4. Job Application Letter.

UNIT 3: **TECHNICAL PROPOSAL and TECHNICAL REPORT** **(8 Hrs)**

1. Technical Proposal - Introduction, Purpose, Features, Types, Format, Importance, and Writing Technical Proposals and Plagiarism.
2. Technical Report - Features, Types, Style, Format, Relevance, and Writing Technical Reports.

UNIT 4: CORPORATE COMMUNICATION SKILLS **(8 Hrs)**

1. Dimensions and importance of EQ
2. Interpersonal communication skills - Life Position, and Transactional Analysis
3. Johari Window: Role of Feedback and Disclosure in Communication; Accepting Criticism
4. Cross Cultural Communication
5. Attitude
6. Perception
7. Personality Attributes and Communication: Self Esteem, Self-Monitoring, Impression Management, and Locus of Control.
8. Conflict and Negotiation

UNIT 5: PROJECT **(6 Hrs)**

REPORT WRITING/ PROPOSAL WRITING

The students will write a Report **OR** a Proposal consisting of 10-15 pages.

REPORT WRITING

1. **For B.Tech. students**-
    a. Technical Report describing new machinery, a report on the sudden break down in production unit, and market survey report for formulating new market strategy.
2. **For B.Pharma. students**
    a. Technical Report based on the site inspection of a drug manufacturing unit, Survey Report on Health Awareness and Self-Medication.
3. **For B.Arch. students**

a. Technical Reports based on a Site Inspection for Geographical and Geological aspects of a particular location, A Report on the Architectural Survey of a Monument. Architectural

PROPOSAL WRITING

1. **For B.Tech. students**
   a. Technical Proposal to organize a Technical Training Program, To develop new range of a product and to start a new venture.
2. **For B.Pharma. students**
   a. Technical proposal to establish a new laboratory, To create new drug-composition and to visit to a Super Specialty Hospital.
3. **For B.Arch. students**
   a. Technical Proposal for an Archeological Site visit , To Construct New Buildings.

Report Writing and Proposal Writing carries 30 marks equivalent to three class tests.

TEXT BOOK

1. Gupta, Ruby. Advanced Technical Communication, Cambridge University Press, New Delhi. 2011.

SUGGESTED REFERENCE BOOKS

1. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011.
2. Tyagi, Kavita& Padma Misra. Advance Technical Communication, PHI, New Delhi.2011
3. Technical Communication, Cengage Learning, New Delhi.2010
4. Technical Communication, OUP, New Delhi. 2013
5. Wallace, Masters Personality Development, Cengage Learning, New Delhi.2006
6. Barrass, Robert: Students Must Write, Foundation books, Cambridge, New Delhi.2006
7. Rao, Bhaskar: Successful Career Soft Skills and Business English, BS Publications, Hyderabad.2012
8. Chakrawarthi: Soft Skills for Professionals, Wiley India.2011

Professional Communication – II Lab

Lab 1	Vocabulary Building
Lab 2	Telephone Etiquette: Making an appointment , answering Calls
Lab 3	Public Speaking
Lab 4	Group Discussion: Do's and Don'ts of GD
Lab 5 & 6	Interview Skills: Preparation
Lab 7	PP Presentation Skills: Techniques of making effective presentation
Lab 8	Meeting : Conducting meetings effectively
Lab 9	Developing Negotiating skills
Lab 10 &11	Reading Comprehension
Lab 12	Evaluation

References: (Software and Videos)

1. Wordsworth English Language laboratory software
2. Wordsworth Prep 1-2-3
3. Communicate
4. Train 2 Success
5. Additional PPTs

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B.Tech. (CSE) with Specialization in Big Data & Analytics
Batch: 2016-20

Course Name	**IBM CE - Software Foundation (Advanced) Course with C ++Programming**
Course Code	RATSWF4BIN **/ DK 2210**
About Technology	Software is the invisible thread that exists today in all systems that we see or experience, be it while travelling, shopping, banking, connecting with friends or performing any other routine task. Software not only integrates information, empowers people, connects global ecosystems, and optimizes business processes but, also brings business, people, and the world together. The technologies and concepts like XML, Information Management and Java form the conceptual foundation of current day software development platforms.
About Course	This course provides conceptual and practical knowledge of the Fundamentals of technologies in the context of building enterprise web based applications. The contents of this course will ensure that a student interest in the subject is well founded and sows a seed for a conceptual understanding of software and computing practices of current generation.
Target Audience	The Software Foundation course enables students in early stages of undergraduate studies who want to make a career in Information Technology industry. Students of: – CS/IT/ECE/EEE Engineering - 1st / 2nd Year – BCA/ BSC – 1st / 2nd year
Pre-requisites	No previous Software knowledge, other than basic computer/Windows usage required. Basic web Programming/HTML and basic database conceptual knowledge is desired.
Contents	1. Introduction to C++ - OOPS - Essentials of Programming - Features of C++ - Inheritance, Polymorphism & Encapsulation Operator Overloading - I/O in C++ - Advanced Topics 2. Information Management - Information as a Service - IBM Information Management Software - Order Fulfillment System – Example Case - Open Source: Derby - Cloudscape - DB2 9 pureXML Technology - DB2 Express-C - DB2 Data Server Editions - Information Integration Business Drivers 3. Introduction to XML and Related Technologies - Issues in information exchange - What is XML? - Exercise: XML basics - Document type definitions (DTDs) - Exercise: Working with DTDs - XML namespaces - Exercise: XML namespaces - XML schema, part 1 - Exercise: Generating XML schemas - XML schema, part 2 - Exercise: XML schemas - XPath

- Exercise: XPath (and quiz)
- XSL transformation: part 1
- Exercise: XSLT part 1 - simple XSL transforms
- XSL transformation: part 2
- Exercise: XSLT part 2 - simple XSL transforms

4. Introduction to Integrated Development Environment – Eclipse

- What is Eclipse
- Eclipse Architecture
- Eclipse Platform Architecture
- Eclipse Plug-in Architecture
- Eclipse Case Studies
- Eclipse Terms and Concepts

5. Java Development Tools

- The JDT environment
- Creating and running a program
- Automating testing with JUnit
- Using Ant and javadoc

6. Debugging Applications

- Using the debugger:
- Starting the debugger
- Setting breakpoints
- Stepping through the code
- Inspecting variables and expressions
- Hot code replace

7. The Eclipse Architecture

- A brief discussion of the Eclipse plug-in architecture
- Finding, installing and updating plug-ins
- Some popular plug-ins

8. Eclipse Web Tools Platform Project 1.0

- Eclipse Web Tools Platform (WTP 1.0) Project
- Web Standard Tools
- J2EE Standard Tools
- The Data Tools Project
- The AJAX Tools Framework

9. Software in Real World:
   The IBM Canvas - some of the tools that students shall learn about and use in their future trainings and projects on the IBM technologies.
10. Software in Real World: The Road Ahead
    The Road Ahead is woven with the overall course content, especially the IBM Canvas to help students in selection of the right career path and the related IBM courses.

Applicable Prometric Certification - NA -

Follow on courses

- IBM CE Minor Projects
- IBM CE – Introduction to Object -Oriented Programming using Java
- IBM CE - Basics of Information Management with DB2
- IBM CE - Basics of IBM Rational Rhapsody
- IBM CE - Introduction to Cloud Computing

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Course Title: **Workshop Practice**			Course Code: **LA1110**
Credit: **1**	L **0**	T **0**	P **2**
Year: **1st**			Semester: **II**

List of Experiments

1. Carpentry: To make a T-Lap joint with soft wood.
2. Arc Welding: To make a Lap joint with mild steel flat by arc welding process.
3. Gas Welding: To make a Lap joint of M.S. sheet with gas welding process.
4. Fitting: To make a plug and socket joint with M.S. flat.
5. Machine Shop: To turn a M.S. rod on lathe to prepare a turning specimen.
6. Sheet Metal: To make a square tray with G.I. sheet.
7. Study of Foundry and Forging tools and equipments

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Course Title: **DATA STRUCTURES**	Course Code: **DA3210**
Credit: **4**	L **3** T **0** P **2**
Year: **2nd**	Semester: **III**

Unit I : **Introduction:** Concept of data structure, Types of data structures, Character String in C, Recursion, Structure, Pointer, Dynamic Allocation, Algorithms, Algorithm analysis, Complexity of algorithms and Time space trade-off.

Arrays: Introduction, Single and multi-Dimensional Arrays, address calculation, application of arrays, Operations defined: traversal, insertion and deletion.

Stacks: Stacks, Array representation of stack, Applications of stacks, Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack.

Unit II : **Queue:** Queue, Array representation and implementation of queues, Circular queues, Operations on Queue: Create Add, Delete, and Full and Empty, De-Queue, Priority queues, Applications of Queues.

Linked Lists: Concept of linked list, Representation and implementation of singly linked list, Circular linked list, doubly linked list, Operations on Linked lists, Concepts of header linked lists, applications of linked lists.

Unit III : **Trees:** Basic terminologies of trees, Binary tree, Complete Binary tree, Extended Binary tree, Representation of Binary tree, Binary tree traversal, Operations on Binary tree.

Binary Search Tree: Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, B-trees.

Unit IV : **Graphs:** Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Representations of Graphs, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.

Unit V : **Searching** & **Hashing:** linear search, binary search, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.

Sorting: Bubble sort, Insertion sort, Selection sort, Quick sort, Merge sort, Heap Sort.

File Handling: Introduction to file handling, Data and Information, File concepts, File organization, files and streams, working with files.

Text Book:

1. Lipschutz, "Data Structures" Schaum's Outline Series, TMH.
2. A. M. Tenenbaum, Langsam, Moshe J. Augentem, Data Structures using C PHI Pub.

Reference Book:

1. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication.
2. Robert Kruse, Data Structures and Program Design in C PHI.
3. Willam J. Collins, Data Structure and the Standard Template library –2003, T.M.H.

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Course Title: **COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES**	Course Code: **DA3220**
Credit: **4**	L **3** T **0** P **2**
Year: **2nd**	Semester: **III**

Unit I : **Introduction:** Numbers and their accuracy, Computer Arithmetic, Errors and their Computation, General error formula, Error in a series approximation.

Solution of Algebraic and Transcendental Equation: Bisection Method, Iteration method, Method of false position, Secant method, Newton-Raphson method, Rate of convergence of Iterative, Newton Raphsion methods.

Unit II : **Interpolation:** Finite Differences, Difference tables Polynomial Interpolation**:** Newton's forward and backward formula Central Difference Formulae: Gauss forward and backward formula, Stirling's, Bessel's, Everett's formula. Interpolation with unequal intervals: Langrange's Interpolation, Newton Divided difference Formula.

Unit III : **Statistical Computation:** Frequency chart, Curve fitting by method of least squares, fitting of straight lines, polynomials, exponential curves, Regression Analysis, Linear and Non linear Regression, Multiple regression.

Unit IV : **Numerical Integration and Differentiation:** Introduction, Numerical differentiation Numerical Integration: Trapezoidal rule, Simpson's 1/3 and 3/8 rule, Boole's rule.

Unit V: **Solution of differential Equations:** Picards Method, Eulers Method, Taylors Method, Runge-Kutta Methods, Automatic Error Monitoring and Stability of solution.

Text Book:

1. Pradip Niyogi, "Numerical Analysis and Algorithms", TMH, 1st Edition.
2. Gerald & Whealey, "Applied Numerical Analysis", AW

Reference Book:

1. Grewal B S, "Numerical methods in Engineering and Science", Khanna Publishers, Delhi.
2. Srimamta Pal Numerical Method Principles, analysis and algorithms, (Oxford Higher ed)
3. Rajaraman V, "Computer Oriented Numerical Methods", PHI, 3rd edition.

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Course Name	**IBM CE – Introduction to Object -Oriented Programming using Java**
Course Code	RPROOPJFN/ **DK 3210**
Course Duration	
About the Technology	Java technology is both a programming language and a platform. The *Java programming language* is a high-level, object-oriented language. Java programs are both *compiled* and *interpreted*. Compilation translates Java code into an intermediate language called Java *bytecode*. Bytecode is in turn parsed and run (interpreted) by the Java Virtual Machine (JVM) — a translator between the language and the underlying operating system and hardware. A compiled Java program can run on any system that has a version of the JVM. The *Java platform* is a software-only platform that can run on top of most hardware platforms. It consists of the JVM and the Java API — a large collection of ready-made components (*classes*) that ease application development and deployment. The Java API spans everything from basic objects, to networking and security, to XML generation and web services. It is grouped into libraries — known as *packages* — of related classes and interfaces.
About the course	The course begins with an introduction to the Java programming language and a review of the principles of object-oriented (OO) development before focusing on how to create object-oriented applications in Java. This course includes topics such as recognizing Java constructs that enable object-orientation. The course provides you with an overview of the Java language syntax, including packages, classes, methods, variables, conditional statements, and control flow. You then learn about the role of inheritance and interfaces in Java, how to create and handle exceptions, and how to refactor code. In addition, this course covers various new features of Java SE 5 and Java SE 6, such as generics, autoboxing, and annotations. You also learn about the different Java application programming interfaces (APIs), focusing on the APIs most commonly used in real-world Java applications such as Collections, Input/Output (I/O), Threads, and other utility classes.
Audience	This course is designed for people with little or no Java programming experience. Students of – Engineering (CS, IT, ECE, EEE)
Pre-Requisites	Some programming experience and familiarity with OO programming.
Contents	– State the advantages of an object-oriented approach to software development – Describe essential object-oriented concepts and terminology – Describe the fundamentals of object-oriented programming – Create Java classes that implement an object-oriented design – Apply Java language constructs that enable and enforce OO-related concepts such as data encapsulation, strict typing and type conversion, inheritance, and polymorphism – Use Java syntax to develop applications in Java – Use inheritance and interfaces in Java applications – Refactor Java code – Describe and use some of the important API classes and interfaces available in Java, including: o Primitive wrapper classes o Classes in the Collections Framework o Utility classes o I/O classes o Threads o Exceptions – Use the Java development tools in Eclipse V3.5 – Debug Java programs – Describe Java EE component model and its use in building server-side applications – Develop, debug, and test server-side applications – Develop and test servlets – Develop and test JSP pages – Learn how to use JSPs and servlets in accordance with the Model/View/Controller(MVC) programming model – Develop, test, and use JSP custom tags
Applicable IBM Certification	-
Follow on Courses	– IBM CE - Enterprise Applications Development using Rational Application Developer – IBM CE - Enterprise Applications for Cloud Environment using IBM Rational Application Developer & IBM SmartCloud – IBM CE - Fundamentals of Software Testing with IBM Rational Tools – IBM CE - Enterprise Mobile Application Development and Deployment using IBM Worklight – IBM CE - Fundamentals of Embedded Software development using IBM Rational Rhapsody (Java)

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Course Title: **DISCRETE MATHEMATICS**	Course Code: **DA3010**
Credit: **3.5**	L: **3** T: **1** P: **0**
Year: **2nd**	Semester: **III**

Unit I

Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs, Set Identities.
Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Order of relations.
Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions.
Natural Numbers: Introduction, Mathematical Induction.

Unit II

Partial order sets: Definition, Partial order sets, Combination of partial order sets, Hasse diagram.
Lattices: Definition, Properties of lattices – Bounded, Complemented and Complete Lattice
Boolean algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra. Combinational and sequential Circuits

Unit III

Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem,
Normal Subgroups, Permutation and Symmetric groups, Group Homeomorphisms, Definition and elementary properties of Rings and Fields, Integers modulo n.

Unit IV

Propositional Logic: Proposition, well-formed formula, Truth tables, Tautology, Contradiction, Algebra of proposition, Theory of Inference ,Natural Deduction.
Predicate Logic: First order predicate, well-formed formula of predicate, quantifiers, Inference theory of predicate logic.
Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle.
Probability: Introduction, Conditional Probability & Independence

Unit V

Graphs: Definition and terminology, Representation of graphs, multigraphs, bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring.
Trees: Definition, Binary tree, Binary tree traversal, binary search tree.
Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.

Text Book:

1. Liu C.L., Elements of Discrete Mathematics, McGraw Hill Int. edn.
2. Kolman B & Busby C.R., Discrete Mathematical Structure for Computer Science, Prentice Hall of India Ltd.
3. Deo N., Graph Theory, Prentice Hall of India.

Reference Book:

1. Trembley J.P. & Manohar R., Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill.

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Course Title: **COMPUTER ORGANISATION**	Course Code: **DA3020**
Credit: **3.5**	L T P **3 1 0**
Year: **2nd**	Semester: **III**

Unit I : **Register Transfer and Micro operation**: Register Transfer Language, Bus and Memory Transfers, Bus Architecture, Arithmetic, Logic, Shift Microoperation, Design of ALU, Design of Fast adder.

Computer Arithmetic: Introduction, addition and subtraction algorithms, Booth Multiplication Algorithms, floating point arithmetic operation, IEEE format for floating point numbers.

Unit II : **Processor Organization**: General register organization, Stack organization, Addressing modes, Instruction format, Data transfer & manipulations, Program Control.

Control Design: Single and multiple bus architecture, Execution of a Complete Instruction, sequencing of control signals, Hardwired control, Micro programmed Control, microinstruction format.

Unit III : **Input-Output Organization**: I/O Interface, Modes of transfer, Interrupts & Interrupt handling, Direct Memory Access, Input-Output processor, Serial Communication.

Unit IV : **Memory Organization**: Memory Hierarchy, Main Memory (RAM and ROM Chips), organization of Cache Memory, Virtual Memory, Memory management hardware.

Unit V : **Parallel Processing**: Flynn's classification, Pipelining- Arithmetic Pipelining, Vector Processing, Array Processor.

Multiprocessor: Characteristic of Multiprocessor, Interconnection Structure, Interprocessor Arbitration.

Text Book:

1. M. Mano, Computer System Architecture, Pearson, 3rd Edition.
2. John P.Hayes, Computer Organization, McGraw Hill, 3rd Edition

Reference Book:

1. Vravice, Zaky&Hamacher Computer Organization, (TMH Publication)
2. Tannenbaum,Structured Computer Organization, (PHI)
3. Stallings ,Computer Organization, (PHI)

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Course Title: **Digital System Design**	Course Code: **FA3220**
Credit: 4.5	L **3** T **1** P **2**
Year: **2nd**	Semester: **III**

UNIT-1: INTRODUCTION **8 L**

Number Systems, Basic & Universal Logic gates, Boolean algebra, Direct Conversion of various base, Negative number representations, Floating point number representation, BCD & EXCESS-3 arithmetic, Error detecting and correcting codes: Hamming code, parity code, Review and Limitation of K-Map, Quine-Mcclusky Method (Tabular Method).

UNIT-2: COMBINATIONAL LOGIC CIRCUITS **8 L**

Characterization of digital circuits: Combinational & Sequential Logic circuit, Design procedure: Adders, Subtractors, Parallel Adder, IC-74LS83 and its applications, Multiplier, Decoder, Encoder, Priority Encoder, Multiplexers, Demultiplexers and their applications, Magnitude Comparators, Code Converters, Parity checker and generator, BCD Adder.

UNIT-3: SEQUENTIAL LOGIC CIRCUITS **6 L**

Latch, Flip-Flops and their conversions, Analysis and Synthesis of Sequential Circuits, Excitation Table & Diagram, Counters: Synchronous & Asynchronous, Shift Registers and their applications, Finite State Machine: Mealy and Moore Models.

UNIT-4: MEMORIES **8 L**

Memory Characteristics and operations , Sequential, Random Access-MOS & C-MOS Static and Dynamic Memory elements, Memory organization: One dimensional and Multidimensional Arrangement, Read Only Memory, ROM as a Decoder, Memory Bank, Address Decoding of Memory (Internal & External), PAL, PLA.

UNIT-5: LOGIC FAMILIES, HAZARDS & FAULT DETECTIONS **10 L**

Logic Families: Diode, BJT & MOS as a switching element, concept of transfer characteristics, ECL, TTL, I2L, Tri-state, PMOS,NMOS and CMOS logic families- Power Consumption, Gate delay and Figure of merit (SPP),Package density, Comparison of standard logic families, pass transistor Logic, Open Collector and Totem pole output stage for TTL. Static and Dynamic Hazards, Gate Delay, Generation of Spikes, Analysis & illustration of Hazard in Combinational Circuits, fault Detection Techniques: Path Sensitization, Boolean Difference Method, K- Map Method.

Text Books:

1. Digital Design, M. Morris Mano and M. D. Ciletti, 4th Edition, Pearson

Reference Books:

1. Digital Systems: Principles and Design, Raj Kamal, Pearson
2. Maini, Digital Electronics: Principles and Integrated Circuits, Wiley India.
3. Switching Theory and Finite Automata, Kohavi, TMH Publications.

Digital System Design Lab

1. Implementation of All Logic Gates using Universal gates (NAND & NOR both).
2. Bread-board implementation (Parallel adder, One bit Multiplier, One bit Magnitude comparator, parity checker)
3. Bread-board implementation of any one code converter (i.e. Gray Code, BCD Code, Excess-3, Hex. etc.).
4. Design of shift registers (SISO, SIPO, PIPO, and PISO), up and down counters.
5. Design of Mod-6 types of Asynchronous Counters.
6. Transfer characteristics of TTL and CMOS inverters.
7. Realization of Decoder, Multiplexer, encoder and De-multiplexers using IC 74138.
8. To design & Implement PAL.
9. To design & implement PLA.
10. Clock circuit realization using 555, CMOS inverter.

*Any two (Value Added)

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Course Title: **THEORY OF COMPUTATION**	Course Code: **DA4010**
Credit: **3.5**	L T P **3 1 0**
Year: **2nd**	Semester: **IV**

Unit I : Mathematical preliminaries, alphabets, strings, languages, states, transition, transition graph, generalized transition graph, Deterministic Finite Automata, Non-Deterministic Finite Automata, Non-Deterministic Finite Automata with ϵ transitions, minimization of DFA.

Unit II : Conversions and Equivalence: Equivalence between NFA with and without ϵ transitions. NFA to DFA conversion; Equivalence between two DFA's, Limitations of FSM; Application of finite automata, Finite Automata with output- Moore & Melay machine and its conversion

Unit III : Regular Languages: Regular sets; Regular expressions, Arden's theorem, Construction of finite Automata for a given regular expression, Pumping lemma for regular sets. Closure properties of regular sets. Grammar Formalism: right linear and left linear grammars; Equivalence between regular linear grammar and FA,

Context free grammar; Derivation trees, sentential forms. Ambiguity in context free grammars; Normal forms: Chomsky normal form and Greibach normal form; Pumping Lemma for Context Free Languages, Closure property of CFL.

Unit IV : Push Down Automata: Push down automata, definition; Acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence; Equivalence of CFL and PDA; Introduction to DCFL and DPDA.

Unit V : Turing Machine: Turing Machine, definition, model, Design of TM, Computable functions Church's hypothesis, Types of Turing machines: Universal Turing Machine, Halting problem, Properties of recursive and recursively enumerable languages, unsolvable decision problem, undecidability of Post correspondence problem, Church turing Thesis.

Text Book:

1. Hopcroft H.E. and Ullman J. D ,"Introduction to Automata Theory Language and Computation",., Pearson Education.
2. J. C. Martin, "Introduction to Languages and the Theory of Computation",3rd edition, Tata McGraw-Hill.
3. C.K.Nagpal, "Formal Languages and Automata Theory", Oxford..

Reference Book:

1. Cohen, "Introduction to Computer theory", Wiley India."Elements of Theory of Computation", Lewis H.P. &Papadimitrou C.H. Pearson, PHI.

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Course Title: **Microprocessors**	Course Code: **FA52A0**
Credit: 4.5	L: **3** T: **1** P: **2**
Year: **3rd**	Semester: **V**

Unit 1

Introduction To Microprocessor: 8085 Evolution Of Microprocessor, Register Structure, ALU, Bus Organization, Timing And Control, instruction set.

Architecture of 16-bit Microprocessors: Architecture of 8086; (Bus Interface Unit, Execution unit) Register Organization, Bus operation, Memory segmentation.

Unit 2

Assembly Language Programming: Addressing Modes and instruction set of 8086, Arithmetic and Logic instructions, Program Control Instructions (jumps, conditional jumps, subroutine call) Loop and string instructions , Assembler Directives.

Unit 3

CPU MODULE: Signal Description of pins of 8086 and 8088, Clock generator, Address and Data bus Demultiplexing, Buffering Memory Organization, Read and Write cycle Timings, Interrupt Structures, Minimum Mode, Maximum Mode Operation.

Unit 4

Peripheral Interfacing: Programmed I/O, Interrupt Driven, I/O, DMA, Parallel I/O, (8255-PPI, Parallel port), 8253/8254 programmable Timer/Counter Interfacing with ADC.

Unit 5

Peripheral Interfacing (Contd.): 8259 Programmable Interrupt controller, 8237 DMA controller, Concept of Advanced 32 bit Microprocessors: Pentium Processor.

Text Book:

1. Ray,A.K. &Burchandi, K.M., "Advanced Microprocessors and Peripherals: Architecture, Programming and Interfacing", Tata McGraw Hill.
2. Hall D.V. , "Microprocessors Interfacing" ,2nd edition, Tata McGraw Hill

Reference Books

1. Gaonkar, Ramesh S., "Microprocessor Architecture, Programming, and Applications with the 8085", Pen Ram International Publishing , 5th edition
2. B.P. Singh &Renu Singh, "Microprocessors and Microcontrollers", New Age International.
3. Liu and Gibson G.A. , "Microcomputer Systems: The 8086/8088 Family", Prentice Hall (India), 2nd edition
4. Brey, Barry B. , "INTEL microprocessors", Prentice Hall (India), 4th edition
5. Ram B., "Advanced Microprocessor & Interfacing" , Tata McGraw Hill
6. Renu Singh & B.P. Singh, "Microprocessors and Interfacing & Applications", New Age International.

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Course Title: **COMPUTER NETWORKS**	Course Code: **DA4210**
Credit: **4**	L: **3** T: **0** P: **2**
Year: **2nd**	Semester: **IV**

Unit I : **Introduction:** Motivation, OSI model, Signals and media, Bits over signals, Synchronous communication, Modulation and modems, Bandwidth, Throughput, and noise, Time division and Frequency division multiplexing, Standards, Switching methods, ISDN.

Unit II : **Packet Transmission:** Multiplexing, Frames, Error correction techniques, LAN/WAN/MAN, Topology, CSMA/CD,LAN protocol, Elementary Data link protocol- Sliding window protocols, Token passing rings, FDDI, IEEE 802.3, 802.5.

Unit III : **Routing Algorithms:** Distance-Vector, Link-State, Shortest path computation, Dijkstra's algorithm, Congestion control, WAN technologies including frame relay, X.25, ATM.

Unit IV : **Internetworking:** Motivation, Concept, Goals, TCP/IP model, IP addressing with sub netting, Address binding with ARP, IP Datagram, Encapsulation IP fragmentation and reassembly, ICMP,IGMP,TCP.

Unit V : **Network Services:** Electronic mail, File transfer, Access and management, Virtual terminals, Remote procedure call.

Text Book:

1. Forouzan, B.A., Data communication and Networking, McGraw Hill (2006) 4th ed.
2. Tanenbaum, A.S., Computer Networks, Prentice Hall (2003) 4th ed.

Reference Book:

1. Comer, D.E., Internetworking with TCP/IP Vol. 1 Principles, Portals and Architecture, Prentice Hall of India (2005) 5th ed.
2. Stallings, W., Computer Networking with Internet Protocols and Tech., Prentice Hall of India (2007).

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Course Title: **WEB TECHNOLOGY**	Course Code: **DA4220**
Credit: **4**	L: **3** T: **0** P: **2**
Year: **2nd**	Semester: **IV**

UNIT 1

Web Essentials: Clients, Servers, and Communication. The Internet - Basic Internet Protocols - The World Wide Web-HTTP request message - response message - Web Clients Web Servers.

Markup Languages: An Introduction to HTML History-Versions-Basic Syntax and Semantics-Some Fundamental HTML Elements-Relative URLs-Lists-tables-Frames-Forms, Pages style sheets-CSS- Core Syntax- Properties-Box Model Normal Flow Box Layout-Other Properties.

UNIT 2

Client- Side Programming: The JavaScript Language-History and Versions Introduction JavaScript in Perspective-Syntax - Variables and Data Types – Statements – Operators – Literals – Functions – Objects – Arrays - Built-in Objects - JavaScript Debuggers, Browsers and the DOM.

PHP: Starting to script on server side, Arrays, function and forms, Advance PHP.

UNIT 3

Representing Web Data: XML-Documents and Vocabularies-Versions and Declaration-Namespaces JavaScript and XML: Ajax-DOM based XML processing Event-oriented Parsing: SAX-Transforming XML Documents-Selecting XML Data: XPATH-Template based Transformations: XSLT-Displaying XML Documents in Browsers-Case Study-Related Technologies, Introduction to JQuery.

UNIT 4

Web Services: Introduction to Web Services, UDDI, SOAP, WSDL, Developing and deploying web services. Ajax – Improving web page performance using Ajax, Programming in Ajax.

UNIT 5

Web 2.0: Interactive and social web**:** Blogs, wikis, and social networking sites – The technology behind these applications - AJAX, Open APIs.

Web 3.0: Semantic Web, Mashups, RDF, Web based Information Systems, Search engines, Recommender Systems, Web Mining.

Text Book:

1. Jeffrey C.Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.57

Reference Book:

1. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007.
2. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006.
3. Marty Hall and Larry Brown,"Core Web Programming" Second Edition, Volume I and II, Pearson Education, 2001.
4. Bates, "Developing Web Applications", Wiley, 2006.

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Course Name **IBM CE - Basics of Information Management with DB2**

Course Code IMDB2BIN / **DK 4250**

About Technology Information Management software offers you end-to-end capabilities to manage data and content, pull together information from diverse sources, and gain valuable insights to optimize business processes.

At the core of IBM's software solution for information management is a powerful family of relational database management system (RDBMS) servers, which provides the right capabilities to manage data and support operational and analytic applications. The integrated data management portfolio provides a modular environment to design, develop, deploy, operate, optimize, and govern data, databases, and data-driven applications. IBM also provides a unified, powerful data warehousing and business intelligence software that gathers, manages, and analyzes data.

About Course This course introduces the features, functions, and services provided by DB2, a relational database management system. Topics covered include: installation; data modeling and design; relational databases; database query languages; relational database design; distributed databases; physical database design; information storage and retrieval; and mapping DB2 vs. Oracle.

Target Audience The Information Management course enables students in early stages of undergraduate studies with an understanding of Relational Database Management concepts and its application in current day data management applications.

Students of:

- CS/IT/ ECE/EEE

Pre-requisites No previous Software knowledge, other than basic computer/Windows usage required.

Contents

Relational Databases	Installation and Planning
Data Modeling	Data Modeling and Database Design
Relational Databases	Introduction to RDBMS
	Understanding a table
	Relational Concepts
Database Query Languages	Simple SQL Queries
	Retrieving Data from Multiple Tables
	Scalar Functions and Grouping
Database Query Languages	Column Functions and Grouping
	Union
	Using Sub-queries
Relational Database Design	Views and Results during DB Design
	Problem Statement
Relational Database Design	Entity Relationship Model
Relational Database Design	Data and Process Inventories
Relational Database Design	Tuple Types
	From Tuple Types to Tables
Relational Database Design	Integrity Rules
Relational Database Design	Indexes
	Logical Data Structures
Distributed Databases	Distributed Data
Physical Database Design	Physical Implementation
	Intermediate SQL
	Maintaining Data
Information Storage and Retrieval	Creating and Accessing DB2 Databases
	Planning Disk Usage
	Data Migration Methods – Loading Tables
	Capacity Management
Information Storage and Retrieval	Data Moving Data
Mapping	DB2 vs. Oracle

Applicable Certification - NA -

Follow on courses

- IBM CE Introduction to Object -Oriented Programming using Java
- IBM CE - Fundamental Course in DB2 - Database Administration for Linux, Unix and Windows
- IBM CE - Fundamentals of Software Testing with IBM Rational Tools

Department of Computer Science & Engineering
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Course Title**: LINUX ADMINISTRATION AND SHELL PROGRAMMING**	Course Code: **DA4242**
Credit: **4**	L **3** T **0** P **2**
Year: **2nd**	Semester: **IV**

UNIT I
Introduction to Linux and Unix, What is an operating system?,A brief history of UNIX,Architecture of the Linux operating system,Logging into (and out of) UNIX systems,Changing your password,General format of UNIX commands. The UNIX filesystem, Typical UNIX directory structure ,Directory and file handling commands ,Making hard and soft (symbolic) links,Specifying multiple filenames,Quotes.

File and directory permissions ,Inspecting file content ,Finding files,Finding text in files,Sorting files,File compression and backup,Handling removable media ,Processes,Pipes,Redirecting input and output,Controlling processes associated with the current shell ,Controlling other processes

UNIT II
Introduction to vi,Basic text input and navigation in vi ,Moving and copying text in vi,Searching for and replacing text in vi,Other useful vi commands,Quick reference for vi ,Introduction to emacs,Basic text input and navigation in emacs,Moving and copying text in emacs,Searching for and replacing text in emacs,Other useful emacs commands ,Other UNIX editors. The superuser root,Shutdown and system startup,Adding users ,Controlling user groups ,Reconfiguring and recompiling the Linux kernel ,Cron jobs,Keeping essential system processes alive.

UNIT III
Unix Shell programming: Types of Shells, Shell Metacharacters, Shell variables, Shell scripts, Shell commands, the environment, Integer arithmetic and string Manipulation, Special command line characters, Decision making and Loop control, controlling terminal input, trapping signals, arrays.

UNIT IV
Introduction of python Shell script

Need for Python, Basic programming fundamentals, Data variables, Operators, First Python program ,Control Structures, String Inbuilt functions, Code flow, Indentation in Python, Knowledge about Python data structures with strings, lists, sets, tuples and dictionaries, Standard library modules introduction with examples. re module usage with functions like split, search, findall , compile etc.

UNIT V
Need of a file. Opening, closing and read/write operations in file., Python errors, exceptions, raising the exception and debugging concept, Basic OOP concepts, Creating classes and objects, Class variables and Object Variables, Method Invocation, Static, Class and Instance Methods, Relationships, Overloading methods, Data Hiding,

Database Programming using Python (Oracle database plugin), Web and CGI Programming using Python.

Text Book:

1. Sumitabh Das, "Unix Concepts and applications", TMH, 2003
2. Yashwant Kanitkar, "Unix Shell Programming", BPB, 2009

Reference Book :

1. Parata, "Advanced Unix programming guide", BPB
2. Meeta Gandhi, Tilak Shetty, Rajiv Shah, "The 'C' Odyssey Unix – the open boundless C", BPB.
3. Mike Joy, Stephen Jarvis, Michael Luck, "Introducing Unix and Linux", Palgrave Macmillan.
4. Rachel Morgan, Henry McGilton, "Introducing Unix System V", TMH

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Course Title: **Probability & Random Variable**	Course Code: **JA5010**		
Credit: 3.5	L	T	P
	3	**1**	**0**
Year: 3rd	Semester: **V**		

UNIT 1:

Theory of Probability & Concept of Random Variable

Axioms of probability: set theory, probability space, conditional, probability. Introduction, distribution and density functions, specific random variables, conditional distributions.

UNIT 2 :

Multiple Random Variables

Bi-variate distributions, one function of two random variables, two functions of two random variables, joint moments, joint characteristic functions, conditional distributions Multiple random variables, sequences of random variables

UNIT 3:

Concept of Stochastic Processes & Random Walks and Other Applications

Definition, systems with stochastic inputs, power spectrum, discrete-time processes. Random walks, Poisson points and shot noise, cyclo-stationary Processes, band-limited processes and sampling theory, deterministic signals in noise.

UNIT 4:

Spectral Representation and Estimation & Mean Square Estimation

Factorization and innovations, finite-order systems and state variables, spectral representation of random processes, ergodicity, spectrum estimation. Prediction, filtering and prediction, Kalman filters. Entropy: Basic concepts, random variables and stochastic processes, MEM.

UNIT 5:

Markov Chain & Queuing Theory

Introduction, higher transition probabilities and the Chapman-Kolmogorov equation, classification of states, stationary distributions and limiting probabilities, transient states and absorption probabilities, branching processes. Markov processes.

Characteristics of Queuing Theory, Queuing Models, Birth & Death Process, Little's Theorem.

Text Books:

1. Probability, Random Variables and Stochastic Processes/A. Papoulis & S. U. Pillai / 4th ed./TMH

Reference Books:

1. Probability, Random Variables & Random Signal Principles/Peyton Z. Peebles, Jr. / TMH

2. Probability & Queuing Theory, R. H. Chitale, Technical Publication Pune

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Course Title**: OPERATING SYSTEMS**	Course Code: **DA5020**
Credit: **3.5**	L T P **3 1 0**
Year: **3rd**	Semester: **V**

Unit I

Introduction: Components of a computer System, Operating system: User view & System view, Evolution of operating system, Single Processor & Multiprocessor systems, Real Time System, Distributed Systems, Multimedia Systems, Handheld Systems.

Operating System Structure: Operating System Services, User Operating System Interfaces: Command-Line and GUI, System Calls,

Unit II

Process Management: Process Concept, Process States, Process Transition Diagram, Process Control Block (PCB).
CPU Scheduling: Scheduling Concepts, Performance Criteria, Scheduling Queues, Schedulers, Scheduling Algorithms: Preemptive & Non Preemptive: FCFS, SJF, Priority, Round-Robin.

Unit III

Concurrent Processes: Principle of Concurrency, Producer / Consumer Problem, Co-operating Processes, Race Condition, Critical Section Problem, Peterson's solution, Semaphores, Classical Problem in Concurrency- Dining Philosopher Problem; Inter Process Communication models and Schemes.

Deadlock: System Model, Deadlock Characterization, Prevention, Avoidance and Detection, Recovery from deadlock.

Unit IV

Memory Management: Bare machine, Resident monitor, Multiprogramming with fixed partition, Multiprogramming with variable partition, Multiple base register, Paging, Segmentation, Virtual memory concept, Demand paging, Performance, Paged replaced algorithm, Allocation of frames, Cache memory.

Unit V

File System: Different types of files and their access methods, various allocation methods.

I/O Management and Disk Scheduling: I/O Devices, Organization of I/O functions, Disk Structure, Disk Scheduling (FCFS, SSTF, SCAN, C-SCAN, LOOK).

Text Book:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley.
2. D M Dhamdhere, "Operating Systems : A Concept based Approach", 2nd Edition.

Reference Book:

1. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education. Harvey M Dietel, " An Introduction to Operating System", Pearson Education

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Course Title**: ALGORITHMS: ANALYSIS & DESIGN**	Course Code: **DA5210**
Credit: **4**	L **3** T **0** P **2**
Year: **3rd**	Semester: **V**

Unit-I

Introduction: Algorithms, Performance Analysis: Space and Time Complexity, Asymptotic Notations- Big Oh, Omega, theta notations, finding complexity of the algorithm, Linear Sorting: Insertion sort, Bubble sort, selection sort.

Unit -II

Advanced Data structures: B-Tree, Binomial Heaps, Fibonacci Heaps, Red & Black Tree.

Divide and Conquer: General method, binary search, quick sort, merge sort, heap sort,

Unit -III

Greedy Method: General method, Activity Selection, job scheduling with deadlines, fractional knapsack problem, Minimum cost spanning tree: Kruskal's and Prim's, single source shortest path, Huffman tree.

Amortized analysis

Unit - IV

Dynamic Programming: General Method, 0-1 Knapsack, Matrix chain multiplication, longest subsequence, all pair shortest paths,

Backtracking- Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.

Unit -V

Branch and Bound: Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.

NP-Hard and NP-Complete problems: Basic Concepts, non-deterministic algorithms, NP-Hard and NP-Complete classes , Cooks Theorm.

Text Book:

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, "Introduction to Algorithms", PHI Pvt. Ltd., 20012.
2. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia,2003 3.
3. M.T.Goodrich and R.Tomassia , Algorithm Design: Foundations, Analysis and Internet examples, Johnwiley and sons.

Reference Book:

1. R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, Introduction to Design and Analysis of Algorithms A strategic approach, McGraw Hill.
2. Aho, Ullman and Hopcroft ,Design and Analysis of algorithms, ,Pearson education.
3. Ellis Horowitz, Satraj Sahni and Rajasekharam, Fundamentals of Computer Algorithms, Galgotia publications pvt. Ltd.

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Course Title**: TRENDS IN BUSINESS INTELLIGENCE**	Course Code: **DL5210**
Credit: **4**	L T P **3 0 2**
Year: **3rd**	Semester: **V**

Course Objective:
The Business Intelligence Analyst career path prepares students to understand report building techniques using relational data models. They will also learn how to enhance, customize, and manage professional reports and will then further be explained about Active reports content and functionality.

Unit I: Business Analytics Overview:
Understand how analytics is transforming the world, Understand the profound impact of analytics in business decisions, Understand what is analytics and how it works, Understand why business analytics has become important in various industries, Understand the history of analytics and how it has changed today Understand how to analyze unstructured data, Understand how analytics is making the world smarter, Understand where the future of analytics lies, Explain why successful enterprises need business analytics, Understand how business analytics can help turn data into insight, Understand how predictive analytics is transforming all types of organizations, Explain how analytics supports retail companies, Understand how analytics can reduce crime rates and accidents, Explain the use of analytics in law enforcement and insurance companies, Understand how analytics can affect the future of education

Understand the importance of business analytics, Comprehend how big data and analytics can help in understanding consumer/customer behavior, Explain how analytics can help manage assets, Understand how analytics can help combat fraud, Explain how analytics can help us to understand social sentiments, Explain what is analytics, Define various types of analytics, Demonstrate how to apply analytics, Describe business intelligence, Demonstrate how to apply business intelligence

Unit II: IBM Cognos Analytics for Consumers:
Learn how to access content, use reports, and create dashboards, Learn how personalize the IBM Cognos Analytics portal.
Examine IBM Cognos Analytics, Explore different report types, Create reports in preview or design mode, Create a simple, sorted, formatted report, Examine dimensionally modelled and dimensional data sources, Explore how data items are added queries, Examine personal data sources and data modules Group, format, and sort list reports, Describe the various options for aggregating data, Create a multi-fact query, Create a report with repeated data, Create filters to narrow the focus of reports, Examine detail filters and summary filters, Determine when to apply filters on aggregate data Format and sort crosstab reports, Create complex crosstab reports using drag and drop functionality, Create crosstab reports using unrelated data items, Create charts containing peer and nested columns, Present data using different chart type options, Add context to charts, Create and reuse custom chart palettes, Introduction to visualization, Present key data in a single dashboard report.

Unit III: IBM Cognos Analytics: Author Reports Fundamentals:
Identify various prompt types, Use parameters and prompts to focus data, Search for prompt types, Navigate between pages, Create calculations based on the data in the data source, Add run-time information to the reports, Create expressions using functions, Enhance report design with report objects, Reuse objects within the same report, Share layout components among separate reports, Discuss report templates, Choose options to handle reports with no available data,

Create multi-lingual reports, Highlight exceptional data, Show and hide data, Conditionally render objects in reports, Conditionally format one crosstab measure based on another, Know how to let users navigate from a
specific report to a target report, Pass parameter values to filter the data in drill-through targets, Navigate through multiple reports, Force page breaks in reports, Modify existing report structures, Apply horizontal formatting, Specify print options for PDF reports
Format data and report objects.

Unit IV: IBM Cognos Analytics- Author Reports Advanced:

Build query models and connect them to the report layout, Edit an SQL statement to author custom queries, Add filters and prompts to a report using the query model, Create reports by merging query results, Create reports by joining queries, Combine data containers based on relationships from different queries, Filter reports on session parameter values, Navigate a briefing book using a table of contents, Create dynamic headers and titles that reflect report data, Let users navigate to specific locations in reports, Create a customer invoice report, Control report displays using prompts, Specify conditional formatting values using prompts, Specify conditional rendering of objects based on prompt selection, Create sorted and filtered reports based on prompt selection, Create a report that displays summarized data before detailed data, Highlight alternate rows in a list report, Create a report using an external data file, Use single data items to summarize report information, Examine the report specification structure, Modify a report specification, Add custom toolbox objects and custom template options, Distribute reports using bursting, Create burst keys, Identify report recipients and data items using burst tables, Distribute reports using email and the Business Analysis Solution Connection, Create tooltips that clarify report data, Send emails using links in a report.

Unit V IBM Cognos Analytics- Author Active Reports

Describe Active Reports, and their value, Save Active Reports, Create Active Reports as prompt pages, Convert existing reports to Active Reports, Explain security considerations in Active Reports, Debug Active Report behavior, Describe active report connections, Filter and select active report controls, Modify the interactive behavior of report controls,
Identify active report controls and variables, Use variables to control multiple controls independently, Control multiple controls from a single variable, Author and optimize active reports for mobile consumption, Describe characteristics of traditional charts in Active Reports, Control data display using decks and data decks, Use decks and data decks to display traditional charts, Optimize decks for performance, Describe characteristics of RAVE visualizations, Predictive Analytics Modeler, Big Data Developer, Data Warehouse Developer.

Learning Outcomes:
Having successfully completed this course, the student can:

1. The importance of analytics and how its transforming the world today
2. Understand how analytics provided a solution to industries using real case studies
3. Explain what is analytics, the various types of analytics, and how to apply it
4. Understand how a business analysis software works, and its architecture
5. Describe a reporting application, its interface, and the different report types

Reference Book:
IBM COURSEWARE.

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Course Title**: ARTIFICIAL INTELLIGENCE**	Course Code: **DA5230**
Credit: **4**	L T P **3 0 2**
Year: **3rd**	Semester: **V**

Unit-1

Introduction- Definitions, Intelligent Agents, Problem solving and Search- Uninformed Search, Informed Search, MiniMax Search, Constraint Satisfaction Problem.

Unit-2

Prolog-Introduction to Prolog, Syntax and Meanings of Prolog Programs, Operators and Arithmetic, Prolog for Artificial Intelligence.

Unit-3

Knowledge Representation- Introduction, Approaches and Issues in Knowledge Representation, Propositional Logic and Inference, First-Order Logic and Inference, Unification and Resolution.

Unit-4

Reasoning- Introduction, Types of Reasoning, Probabilistic Reasoning, Probabilistic Graphical Models, Certainty factors and Rule Based Systems, Introduction to Fuzzy Reasoning.

Unit-5

Planning and Learning- Introduction to Planning, Types-Conditional, Continuous, Multi-Agent.
Introduction to Learning, Categories of Learning, Inductive Learning, Reinforcement Learning, Decision Tree Learning, Basic Introduction to Neural Net Learning.

Text Book:-

1. Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education Asia, Third Edition, 2015.
2. Elaine Rich, Kevin Knight and Shivashankar B.Nair, “Artificial Intelligence”, Tata McGraw-Hill, Third edition, 2009.
3. Nils J.Nilsson, “Artificial Intelligence - A New Synthesis", Harcourt Asia Pvt. Ltd., Morgan Kaufmann, 1988.

References Book:-

1. Ivan Bratko, “Prolog Programming for Artificial Intelligence”, Pearson Education Asia, First Edition, 2007.
2. Dan W. Patterson, “Introduction to Artificial Intelligence and Expert Systems”, PHI Learning, Second Edition, 2005.

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Batch: 2016-20

Course Title: **Principles of Management**	Course Code: **HA5010**
Credit: 2	L: **2** T: **0** P: **0**
Year: **3rd**	Semester: **VI**

UNIT – 1

Introduction to Management

Theories of management: Traditional behavioral, contingency and systems approach. Organization as a system.

UNIT – 2

Management Information

Interaction with external environment, Managerial decision making and MIS.

UNIT – 3

Planning Approach to Organizational Analysis

Design of organization structure; Job design and Enrichment; Job evaluation and merit rating.

UNIT – 4

Leading and Control

Theories of motivation, Leadership styles and managerial grid. Co-ordination, Monitoring and Control in organizations. Techniques of Control. Japanese management techniques.

Minor Project: Submission of 15 pages of Case Studies on above.

Suggested Books:

1. Peter Drucker, Harper and Row: The Practice of Management.
2. *Koontz H*, Weihrich,H. Essentials of Management, *Tata McGraw-Hill* Education, 2006.
3. Schermerhorn, John R. Management and Organizational Behavior Essentials, Wiley India,2005
4. Staner: Management, PHI Learning
5. Hirschey. Managerial Economics, Cengage Learning, 2009.
6. Chhabra, A. Principle of Management, Sun India publication , 2012

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Course Title**: COMPUTER GRAPHICS**	Course Code: **DA6210**
Credit: **4**	L T P **3 0 2**
Year: **3rd**	Semester: **VI**

Unit I : **Introduction to computer graphics and primitives algorithms:** Points, planes, pixels and frames buffers, lines, circles and ellipse drawing algorithms, display devices, primitive devices, applications of computer graphics.

Unit II : **Two-Dimensional Transformation:** Introduction to transformation matrix, **Types of transformations in 2-D:** Identity Transformation, Scaling, Reflection, Shear Transformation, Rotation, Translation, Rotation about an arbitrary point, Combined Transformation, Homogeneous coordinates, 2-D transformation using homogeneous coordinates.

Unit III : **Three-Dimensional Transformation:** Objects in homogeneous coordinates, **3-D Transformation:** Scaling, Translation, Rotation, Shear Transformations, Reflection, world coordinates and viewing coordinates, Projection, parallel Projection, Perspective projection. **Hidden Lines and Surfaces:** Back face removal algorithms, Hidden lines methods..

Unit IV : **Viewing and Solid Area Scan-Conversion:** Introduction to viewing and clipping, viewing transformation in 2-D, Point Clipping, Line Clipping, Introduction to polygon Clipping, Viewing and clipping in 3-D, Three Dimensional Viewing Transformations, Text Clipping, generalize Clipping, Multiple windowing.

Introduction to Solid Area Scan: Conversion, Inside-Outside Test, Winding Number Method and Coherence Property, Polygon Filling, Seed Fill Algorithms, Scan Line Algorithm, priority Algorithm, Scan Conversion of Characters, Aliasing, Anti-aliasing, Halfoning, Threshold and Dithering.

Unit V : **Introduction to curves:** Curves Continuity, Conic Curves, Piecewise Curve Design, Spline curve representation, Bezier Curves, Fractals and its Applications.

Object rendering: Introduction to Object Rendering, Shading, Ray Tracing, Illuminational model, Colour Models.

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Text Book:

1. R.K. Maurya, Computer Graphics, John Willey.
2. David F. Rogers, Procedural Elements of Computer Graphics, Tata McGraw Hill.

Reference Book:

1. Donald hearn and M.Pauline Beaker, Computer Graphics, Prentice Hall of India.
2. Steven Harrington, Computer Graphics, McGraw Hill.

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Course Title**: DOT NET TECHNOLOGIES**	Course Code: **DA6220**
Credit: **4**	L T P **3 0 2**
Year: **3rd**	Semester: **VI**

Unit I : **Introduction to C#:** C# Language Fundamentals: An Anatomy of a basic class, Creating objects: Constructor basic, the composition of an application, Default Assignment and variable scope, member initialization syntax, Basic input and output with the console class, Understanding value types and reference types, the master node: System. Objects, The system Data type (And C# aliases), Converting between value type and reference type: Boxing and Unboxing, Defining program constraints, Iterations constructs, control flow constructs, The complete set operator, Defining Custom class methods, Understanding static methods, Method parameter modifiers, Array manipulation, String manipulation, Enumerations, Defining structures, Defining custom namespaces.

Unit II : **Object Oriented Aspects Of C#:** Formal definition of the class, Definition the "Default public interface" of a type, Recapping the pillars of OOP, The first pillar: Encapsulation services, Pseudo Encapsulation: Creating read only field, The second pillar: Inheritance supports keeping family secrets: The "Protected" keyword, The Nested type definitions, The third pillar: Polymorphic support casting between types, Generating class definitions using Visual Studio.Net. Exceptions and Objects Life Time Ode to errors, Bugs and exceptions, the role of .NET exceptions handling, the system. Exception base class throwing a generic exception catching exception, CLR system level exception(System. system exception), Custom application level exception (System. application exception), Handling multiple exception, The finally block The last chance exception, dynamically identify application and system level exception, Debugging system exception using VS.Net, Understanding Object life time, The CIT of new, The basic of garbage collection, Finalizing a type, Finalization process, building and Ad hoc destruction method, garbage collection optimization, The system .GC type.

Unit III : **The Clr And The .Net Framework:** The building Block of the .NET platform (CLR,CTS,CLS), the role of the .NET base class libraries, , additional .NET Aware programming Languages, Understanding .Net Assembles, Problems with classic COM Binaries, The role of the common intermediate language, The role of .NET type metadata, The role of the assembly manifest, Compiling CIL to platform specific instruction. Building a simple file test assembly, Cross Language Inheritance. Building the multi file assembly, Using the multi file assembly, Understanding private assemblies, robing for private assemblies (The Basics), Private assemblies and XML Configuration files, Probing for private assemblies (The details),Understanding Shared assembly, Understanding Shared Names, Building a shared assembly, Understanding delay Signing, Installing/Removing shared assemblies, Using a Shared assembly.

Unit IV : **Application Development On .Net:** Using the visual studio.Net IDE, key aspects of the VS.Net IDE, Documenting source code via XML, Building Windows Applications, Event Driven Programming, Delegate, Event and its association, Synchronous and asynchronous operation with delegate, User Defined events and delegates,ADO.NET Architecture,.NET Framework Data Providers, Data set, Data reader, data adapter, Accessing Data with ADO.NET..

Unit V : **Web Based Application Development On .Net:** Introduction to web form, Need of Web Application, Static and Dynamic Page, Working of IIS and Browser, Differences between ASP and ASP.NET, understanding post back, understanding page life cycle, State management, Server control form validation, Master pages, ASP.NET web security, server control form validation, Programming Web Applications with Web Forms, Web service, Programming Web Services

Text Book:

1. E. Balagurusamy, "Programming in C#", Tata McGraw-Hill, 2004. (Unit I, II)
2. J. Liberty, "Programming C#", 2nd ed., O'Reilly, 2002. (Unit III, IV, V)

Reference Book:

1. Herbert Schildt, "The Complete Reference: C#", Tata McGraw-Hill, 2004.
2. Robinson et al, "Professional C#", 2nd ed., Wrox Press, 2002.
3. Andrew Troelsen, "C# and the .NET Platform", A! Press, 2003.
4. S. ThamaraiSelvi, R. Murugesan, "A Textbook on C#", Pearson Education, 2003.

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Course Title**: COMPILER DESIGN**	Course Code: **DA6230**
Credit: **4**	L T P **3 0 2**
Year: **3rd**	Semester: **VI**

Unit I : **Introduction:** Review of Languages & Grammar, Compiler and Interpreter- Basic Concepts. Phases and Passes, Design Issues using Finite State Machines, Scanner Generator- LEX. Formal Grammar and their application to Syntax Analysis, Ambiguous Grammar, The Syntactic specification of Languages: CFG, Derivation and Parse Trees, Capabilities of CFG, BNF Notation.

Unit II : **Basic Parsing Techniques:** Parsing-Top Down and Bottom-Up Strategies: General Consideration. Top Down Parsing: Brute-Force Method, Recursive Descent, & Predictive Paring. Bottom-Up Parsing: Shift Reduce Parsing, Operator Precedence Parsing. LR Grammars-LR(0), SLR(1), Canonical LR(1) & LALR(1) Parser, Comparison of parsing methods.

Unit III : **Semantic Analysis:** Basic Concepts, Syntax Directed Definitions-Inherited & Synthesized Attributes, Evaluation Orders of SDDs. Syntax directed Translation Schemes, Intermediate Codes, Postfix notation, Parse Trees and Syntax Trees, Directed Acyclic Graphs, Three address Codes: Quadruple & Triples, Translation of Assignment Statements, Boolean expressions, Control Statements, Postfix Translation, Translation with a Top Down Parser, Array References in Arithmetic expressions, Procedure Calls, Declarations and Case statements Translations.

Unit IV : **Symbol Tables:** Organization of Non-Block Structured Language (Unordered /Ordered/ Tree/ Hash) and Block Structured Language (Stack Tables & Stack Implementation), Runtime Storage Management: Static Allocation, Dynamic Allocation- Activation Records and their usage, Recursive Procedure. Heap Allocation-Storage Registers and Release Strategies.

Unit V : **Error detection and Recovery:** Code Optimization- Basic Blocks and Optimization, Loop Optimization, Flow Graph Analysis, Machine Dependent Optimization.

Error Handling: Detection, Reporting, Recovery and Maintenance, Compiler-Compiler—YACC, Code Generation, Concept of Compiler Design for Object-Oriented Language.

Text Book:

1. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, "Compilers-Principles, Techniques & Tools", Pearson Education

Reference Book:

1. Robin Hunter, " Essence of Compilers", Pearson Education
2. Steven S. Muchnick, Advanced Compiler Design & Implementation, Morgan Kaufmann Publishers

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Batch: 2016-20

Module Title : OOAD & Software Development Life Cycle
Course Code : DK 6050

Indicative Contents:

Coverage
Best Practices of Software Engineering, Concepts of Object Orientation, Essentials of Visual Modeling
Requirements Overview, Analysis and Design Overview, Architectural Analysis, Use-Case Analysis
Identify Design Elements, Identify Design Mechanisms
Describe the Run-time Architecture, Describe Distribution, Use-Case Design, Objectstore Mechanism, Security Mechanism, UML to C++ Mapping, UML to Java Mapping, UML to Visual Basic Map, UML to Visual Basic Map

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Course Title: **Engineering Economics**	Course Code: **GC5010**
Credit: 2	L: **2** T: **0** P: **0**
Year: **3rd**	Semester: **VI**

UNIT-I

Time value of money: Simple and compound interest, Time value equivalence, Compound interest factors, Cash flow diagrams, Calculation, Calculation of time –value equivalences. Present worth comparisons, Comparisons of assets with equal, unequal and infinite lives, comparison of deferred investments, Future worth comparison, payback period comparison.

UNIT-II

Use and situations for equivalent annual worth comparison, Comparison of assets of equal and unequal life. Rate of return, Internal rate of return, comparison of IIR with other methods, IRR misconceptions.

UNIT-III

Analysis of public Projects: Benefit/ Cost analysis, quantification of project, cost and benefits, benefit/ cost applications, Cost –effectiveness analysis.

UNIT-IV

Depreciation, computing depreciation charges, after tax economic comparison, Break-even analysis; linear and non-linear models. Product and Process Costing, Standard Costing, cost estimation, Relevant Cost for decision making, Cost control and Cost reduction techniques.

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Batch: 2016-20

Course Title: **MOBILE COMPUTING**	Course Code: **DA6640**
Credit: **3**	L: **3** T: **0** P: **0**
Year: **4th**	Semester: **VI**

Unit I

Introduction: Introduction to mobile computing. Convergence of Internet, digital communication and computer networks. Sharing of wireless channels: FDMA, TDMA, CDMA. MAC layer issues in wireless communication

Unit II

Mobility Management: Impacts of mobility and portability in computational model and algorithms for mobile environment. Disconnected operation, handling handoffs. Analysis of algorithms and termination detection.Types of Mobility. Mobility in cellular based wireless network: channel allocation, interferences, handoffs and location management. IP mobility: Mobile IP and IDMP

Unit III

Wireless LAN: Infrared vs. Radio transmission, Infrastructure and Ad hoc Networks, IEEE 802.11: System architecture, Protocol architecture, Physical layer, Medium access control layer, MAC management, Future development; HIPERLAN: Protocol architecture, Physical layer, Channel access control.Sub layer, Medium access control Sub layer, Information bases and Networking; Bluetooth: User scenarios, Physical layer, MAC layer, Networking. Security, Link management. Personal Area Network: Bluetooth and ZigBee. Network layer issues ad hoc and sensor networks

Unit IV

Data Models: Data delivery models: push and pull. Data dissemination in wireless channels. Broadcast disks. Effects of caching,Indexing in Air, Mobile Databases and transaction

Unit V

Distributed Mobile Environment: Distributed file system for mobile environment, Mobile Middleware: Service discovery, adaptation, mobile agents.

Text Book:

1. Schiller, “Mobile Communications”, PHI/Pearson Education, Second Edition.
2. William Stallings, “Wireless Communications and Networks”, PHI/Pearson Education.

Reference Book:

1. T. Rappaport, "Wireless Communication: Principles and Practice", Pearson Education.
2. Reza B'Far (Ed), "Mobile Computing Principles", Cambridge University Press.

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Course Title**: DATA BASE ADMINISTRATION**	Course Code: **DA6650**
Credit: **3**	L T P **3 0 0**
Year: **4th**	Semester: **VI**

UNIT I Introduction

Oracle Architectural Components, Getting Started With Oracle Server , Managing an Oracle Instance, Creating a Database, Data Dictionary Contents and Usage, Maintaining the Control File, Redo Log Files, Managing Tablespaces and Data Files, Storage Structures and Relationships, Managing Undo Data, Tables, Indexes, Maintaining Data Integrity, Managing Password, Managing Security, Resources, users, Privileges & Roles, Loading Data Into a Database & Globalization Support

UNIT II DBA Fundamentals

Networking Overview, Basic Oracle Net Architecture, Server-Side Configuration, Basic Oracle Net Services Client-Side Configuration, Usage and Configuration of the Oracle Shared Server, Backup and Recovery Overview, Instance and Media Recovery Structures, Configuring the Database Archiving Mode, Oracle Recovery Manager Overview and Configuration, User Managed Backups, RMAN Backups, User Managed Complete & Incomplete Recovery, RMAN Complete Recovery, Incomplete Recovery & Maintenance, Recovery Catalog Creation and Maintenance, Transporting Data Between Databases

UNIT III Performance Tuning

Overview Of Oracle 9i Performance Tuning, Diagnostic and Tuning Tools, Sizing the Shared Pool & the Buffer Cache, Sizing The Other SGA Structures, Database Configuration and I/O Issues, Optimizing Sort Operations, Diagnosing Contention For Latches, Tuning Rollback Segments, Monitoring and Detecting Lock Contention, Tuning The Oracle Shared Server, Application Tuning, Using Oracle Blocks Efficiently SQL Statement Tuning, Tuning the OS and Using Resource Manager

UNIT IV Managing Oracle

Oracle10i: Overview, Preparing the Operating System & Install Oracle9i Software, Create a Custom Oracle Database, Install and Configure Enterprise Manager, Customize the Oracle Database Linux Measurement Tools, Oracle Measurement Tools, Tuning Oracle

UNIT V Database Troubleshooting

One Time Troubleshooting, Adhoc Troubleshooting, Escalations, Connectivity, Business Continuity, High Availability and Scalability, Data Sharing and information Integration

Text Book:

1. Oracle Database Administrator's Guide
2. Oracle DBA Handbook

Reference Book:

1. Michael Wessler Oracle DBA on Unix and Linux

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Big Data & Analytics
Batch: 2016-20

Course Title: **Genetic Algorithms & Probabilistic Reasoning**	Course Code: **DA6620**
Credit: **3**	L: **3** T: **0** P: **0**
Year: **3rd**	Semester: **VI**

UNIT 1 **(8L)**

Fuzzy Sets (Introduction)

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory, Basic operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

UNIT2 **(8L)**

Fuzzy Logic (Fuzzy Membership, Rules)

Membership functions, Propositional logic and predicate logic, Inference in fuzzy logic, Fuzzy if-then rules, Fuzzy mapping rules, Fuzzy implications, Min-Max Theorem, Resolution Rule under Fuzzy environment, Refutation method for theorem proving, Defuzzifications,

UNIT3 **(8L)**

Reasoning with uncertain and incomplete information: The statistical approach to uncertainty, Introduction, Uncertain & incomplete knowledge. Review of Probability theory

UNIT4 **(8L)**

Bayes Theorem, Bayesian Networks, Bayesian reasoning. Decision Making, Joint Probabilities, Relationships, Polytrees., Dempster-Shafer theory of evidence, Certainty Factor, Non-monotonic systems.

UNIT 5 **(8L)**

Theoretical Foundation of Genetic Algorithms

Introduction: Basic Operators: Reproduction, Crossover & Mutation. Fitness function. Search Space, Schemas & Two-Armed and k-armed problem, Exact mathematical models, Applications of Genetic Algorithms.

Text Book:

1. G.J.Klir , Yuan,"Fuzzy Sets and fuzzy logic, Theory and applications", Prentice Hall India, 1995.
2. David E. Goldberg, "Genetic algorithms in search, optimization & Machine Learning" Pearson Education, 2006
3. Stuart Russel, Peter Norvig, "Artificial Intelligence A Modern Approach" Pearson (3rd Ed.)

Reference Book:

1. John Yen, Reza Langari, "Fuzzy Logic Intelligence, Control and Information", Pearson Education, 2006.
2. Timothy J Ross, "Fuzzy Logic with Engineering Applications", 2nd Edition, John Wiley, 2004.
3. H. Zimmermann, "Fuzzy Set Theory and its applications", 2nd Edition, Allied Publishers, 1996.
4. Melanle Mitchell, "An introduction to genetic algorithms", Prentice Hall India, 2002.

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Big Data & Analytics
Batch: 2016-20

Course Title**: INTELLIGENT SYSTEMS**	Course Code: **DK6210**
Credit: **4**	L: **3** T: **0** P: **2**
Year: **4th**	Semester: **VI**

Course Objective:

The Artificial Intelligence career path prepares students to apply AI in real-life. This will require skills in Cognitive Computing, Natural Language Processing (NLP), Conversation (Chatbots), and Computer vision. Training topics will include AI, IBM Watson, hands-on and case studies on NLP, Chatbots, and Vision.

Unit 1 ARTIFICIAL INTELLIGENCE OVERVIEW

Describe the eras of computing, Explain the difference between deterministic and probabilistic systems, Describe the types of AI, Explain what the main focus of AI is, Explain what machine learning is, Describe the types of machine learning, Explain what neural networks are and why they are important in today's AI's field Explain what domain adaptation is and its applications, Explain what NLP is, Describe different NLP, processes, List tools and services for NLP, Identify NLP use cases, Define CV, Know the history of CV and its advancement with AI, List tools and services for CV, Identify CV use cases, Explain what cognitive computing is, Describe the characteristics of cognitive systems, Explain the landscape of cognitive computing in the industry, Setup your IBM Bluemix Account.

Unit 2: ARTIFICIAL INTELLIGENCE FOUNDATIONS

Explain what IBM Watson is and how it works, Explain How Watson technology is made available to developers and organizations, Describe how Watson technology is being applied to solve real world problems, Explain what the Deep QA architecture was, Explain why IBM decided to commercialize Watson, Describe the evolution of Watson services from the original DeepQA architecture to the present, Recognize the Watson services available today on the IBM Cloud, List the Watson services, Explain the capabilities of each Watson service, Describe the purpose of training the various Watson services to adapt them to a closed domain, List the Watson services that can be trained, List the Watson services that cannot be trained, Describe what Watson Knowledge studio is, List the Watson services that can be trained with Watson Knowledge Studio, Use Watson API Explorer to interact with the Watson services REST API, to test your calls to the API, and to view live responses from the server, Use Watson API Explorer to become familiar with Watson services.

Unit 3: ARTIFICIAL INTELLIGENCE ANALYST - Natural Language Processing

Explain what NLP is, Describe different NLP processes, List tools and services for NLP, Identify NLP use cases, Define different components of NLP, Define challenges within NLU, Explain the NLP pipeline, Explain the concepts of information extraction and sentiment analysis, Define the capabilities of IBM Watson Natural Language Classifier (NLC), Describe how to train Watson NLC, Define the capabilities of Watson Natural Language Understanding (NLU) service and its input and output, along with the discovery service, Explain the capabilities of the Watson Tone Analyzer service and its input and output, Create a

Watson Discovery service instance, Create a collection, Add content to a collection, Build queries, Use the Discovery API.

Unit 4: ARTIFICIAL INTELLIGENCE ANALYST – Chatbots

Explain what a chatbot is, Describe common applications of chatbots, Identify factors that drive the growing popularity of chatbots, List examples of tools and services that you can use to create chatbots, What a workspace is, What an intent is, What an entity is, What a dialog is, What dialog nodes are, How the nodes in a dialog are triggered, How the dialog flow is processed, The advanced features of a chatbot, Create a workspace, Build a dialog, Create a Watson Conversation service instance, Create a Conversation workspace, Add intents, Build a dialog, Test in Slack.

Unit 5: ARTIFICIAL INTELLIGENCE ANALYST -Computer Vision

Define CV, Know the history of CV and its advancement with AI, List tools and services for CV, Identify CV use cases, Define the main pipeline within a CV application, Understand how feature extraction works, Understand how image classification and recognition works, Define known techniques and classifiers that are used today for CV, Describe the IBM Watson Visual Recognition service, List the features available with Watson Visual Recognition, Describe the output provided by the Watson Visual Recognition service, Explain the capabilities of the default classifier, Explain the difference between a default and a custom classifier Describe how to train a custom classifier, Create a Watson Visual Recognition service and obtain the API key value, Use Visual Recognition API methods to: o Classify images, Detect faces in an image o Recognize text in an image, Create and train a custom classifier.

Learning Outcomes:

Having successfully completed this course, the student can:

1. Describe the field of AI and its subfields machine learning, NLP and computer vision
2. Describe the types of AI
3. List the factors that influenced the advancements of AI in recent years
4. List applications of AI
5. Explain what Machine Learning is.

Reference Book:

1. IBM COURSEWARE.

Department of Computer Science & Engineering
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Batch: 2016-20

Course Title**: DISTRIBUTED COMPUTING**	Course Code: **DA7010**
Credit: **3.5**	L T P **3 1 0**
Year: **4th**	Semester: **VII**

Unit I : **Fundamentals of Distributed Computing:** Introduction to distributed computing Systems, Resource sharing and the Web Challenges.
System Models: Architectural models, Fundamental Models
Theoretical Foundation for Distributed Computing System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks, Causal ordering of messages, global state, termination detection.

Unit II : **Distributed Mutual Exclusion**: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.
Distributed Deadlock Detection: system model, resource Vs communication deadlocks deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

Unit III : **Distributed Objects and Remote Invocation**: Communication between distributed objects, Remote procedure call, Events and notifications, Java RMI case study.
Distributed File Systems: File service architecture, Sun Network File System, The Andrew File System, Recent advances.

Unit IV : **Transactions and Concurrency Control**: Flat and nested distributed transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control.
Distributed Transactions: Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Atomic Commit protocols.

Unit V : **Introduction to Grid Computing:** Basics of grid Computing, Benefits of grid computing, Grid terms and concepts, Grid user roles, Standards for grid environments, Grid security requirements.
Introduction to Parallel Processing: Basic Concepts: Introduction to parallel processing, parallel processing terminology, Parallel & Distributed Programming: Parallel Programming environments

Text Book:

1. Tannenbaum, A, Van Steen. Distributed Systems, Principles and Paradigm , Prentice Hall India, 2002
2. Tannenbaum, A. Distributed Operating Systems, Pearson Education. 2006

Reference Book:

1. Attiya, Welch, "Distributed Computing", Wiley India, 2006
2. Singhal and Shivaratri, "Advanced Concepts in Operating Systems", McGraw Hill, 1994
3. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Ed.

Department of Computer Science & Engineering
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Course Title**: ADVANCED COMPUTER ARCHETECTURE**	Course Code: **DA7020**
Credit: **3.5**	L T P **3 1 0**
Year: **4th**	Semester: **VII**

UNIT 1 ***(6L)***

Introduction: Parallel Computing, Parallel Computer Model, Program and Network Properties, Parallel (Architectural Classification Schemes, Flynn's & Feng's Classification, Performance Metrics and Measures, Speedup Performance Laws: Multiprocessor System and Interconnection Networks; IEEE POSIX Threads: Creating and Exiting Threads, Simultaneous Execution of Threads, Thread Synchronization using Semaphore and Mutex, Canceling the Threads.

UNIT 2 ***(9L)***

Pipelining and Memory Hierarchy: Basic and Intermediate Concepts, Instruction Set Principle; ILP: Basics, Exploiting ILP, Limits on ILP; Linear and Nonlinear Pipeline Processors; Super Scalar and Super Pipeline Design; Memory Hierarchy Design: Advanced Optimization of Cache Performance, Memory Technology and Optimization, Cache Coherence and Synchronization Mechanisms.

UNIT 3 ***(8L)***

Thread and Process Level Parallel Architecture: Introduction to MIMD Architecture, Multithreaded Architectures, Distributed Memory MIMD Architectures, Shared Memory MIMD Architecture, Clustering, Instruction Level Data Parallel Architecture, SIMD Architecture, Fine Grained and Coarse Grained SIMD Architecture, Associative and Neural Architecture, Data Parallel Pipelined and Systolic Architectures, Vector Architectures.

UNIT 4 ***(8L)***

Parallel Computing model: Sequential model, need of alternative model, parallel computational models such as PRAM, LMCC, Hypercube, Cube Connected Cycle, Butterfly, Perfect Shuffle Computers, Tree model, Pyramid model, Fully Connected model, PRAM-CREW, EREW Models.

UNIT 5 ***(9L)***

Parallel Algorithms: PRAM Algorithms: Parallel Reduction, Prefix Sums, Preorder Tree Traversal, Merging two Sorted lists; Matrix Multiplication: Row Column Oriented Algorithms, Block Oriented Algorithms; Parallel Quicksort, Hyper Quicksort; Solving Linear Systems: Gaussian Elimination, Jacobi Algorithm; Parallel Algorithm Design Strategies.

Text Book:

1. Kai Hwang," Advance Computer Architecture", TMH
2. Matthew, "Beginning Linux Programming", SPD/WROX

Reference Book:

1. Hennessy and Patterson," Computer Architecture: A Quantitative Approach", Elsevier
2. Dezso and Sima, "Advanced Computer Architecture", Pearson
3. Quinn, "Parallel Computing: Theory & Practice", TMH
4. Quinn, "Parallel Programming in C with MPI and Open MP", TMH

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Big Data & Analytics
Batch: 2016-20

Course Title: **CRYPTOGRAPHY AND NETWORK SECURITY**	Course Code: **DA7210**
Credit: **4**	L: **3** T: **0** P: **2**
Year: **4th**	Semester: **VII**

Unit I : Introduction to security attacks, services and mechanism, introduction to cryptography.

Conventional Encryption: Conventional encryption model, classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography,stream and block ciphers.

Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard(DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES, confidentiality using conventional encryption, traffic confidentiality, key distribution

Unit II : Introduction to prime and relative prime numbers, finite field of the form GF(p), modular arithmetic, Fermat's and Euler's theorem, primarily testing, Euclid's Algorithm, Chinese Remainder theorem, Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffie-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elgamel encryption.

Unit III : **Message Authentication and Hash Function:** Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm(SHA).Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm.

Unit IV : **Authentication Applications:** Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), S/MIME.

Unit V : **IP Security:** Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

Web Security: Secure socket layer and transport layer security, secure electronic transaction (SET).

System Security: Intruders, Viruses and related threads, firewall design principals, trusted systems.

Text Book:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Prentice Hall, New Jersy.

Reference Book:

1. Johannes A. Buchmann, "Introduction to Cryptography", Springer-Verlag.
2. Bruce Schiener, "Applied Cryptography".

Department of Computer Science & Engineering
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Batch: 2016-20

Course Title**: DATAWAREHOUSE & DATA MINING**	Course Code: **DA7030**
Credit: **3.5**	L T P **3 1 0**
Year: **4th**	Semester: **VII**

Unit I : Overview, Motivation (for Data Mining), Data Mining-Definition & Functionalities.

Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting. ROLAP, MOLAP, HOLAP.

Unit II : **Data Pre-Processing**: Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Inconsistent Data, Data Integration and Transformation.

Data Reduction: Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation.

Unit III : **Concept Description:** Definition, Data Generalization, Analytical Characterization,

Analysis of attribute relevance, Mining Class comparisions, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases

Unit IV : **Classification:** What is Classification, Issues regarding Classification, Decision tree, Bayesian Classification, Classification by Back propagation.

Unit V : **Cluster Analysis:** Data types in cluster analysis, Partitioning methods. Hierarchical Clustering- CURE and Chameleon, Density Based Methods-DBSCAN, OPTICS, Grid Based Methods- STING, CLIQUE, Outlier Analysis

Text Book:

1. Jiawei Han, Micheline Kamber, "Data Mining Concepts & Techniques" Elsevier

Reference Book:

1. M.H.Dunham,"Data Mining:Introductory and Advanced Topics" Pearson Education
   Mallach,"Data Warehousing System",McGraw –Hill

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Big Data & Analytics
Batch: 2016-20

Course Title**: DATA SCIENCE**	Course Code: **DL8210**
Credit: **4**	L **3** T **0** P **2**
Year: **4th**	Semester: **VII**

Course Objective:

The Big Data Engineer career path prepares students to use the Big Data platform and methodologies in order to collect and analyze large amounts of data from different sources. This will require skills in Big Data architecture, such as Apache Hadoop, Ambari, Spark, Big SQL, HDFS, YARN, MapReduce, ZooKeeper, Knox, Sqoop, and HBase.

Unit 1 Introduction to the Big Data Ecosystem

Understand what Big Data is, Develop an understanding of the complete open-source Hadoop ecosystem and its near term future directions, Understand the major challenges of data, Understand how the growth of interconnected devices helps big data, List some real life examples of Big Data, Learn the types of Big Data, Student some Big Data use cases, Develop an understanding of the complete open-source Hadoop, ecosystem and its near term future directions, Be able to compare and evaluate the major Hadoop distributions and their ecosystem components, both their strengths and their limitations, Gain hands-on experience with key components of various big data ecosystem components and their roles in building a complete big data, solution to common business problems, Learning the tools that will enable you to continue your big data education after the course, Describe the functions and features of HDP, List the IBM value-add components, Explain what IBM Watson Studio is, Give a brief description of the purpose of each of the value-add components, Explore the lab environment, Launch Apache Ambari, Start a variety of services using Apache GUI, Explore some of the directory structure on the Linux system, Understand the purpose of Apache Ambari in the HDP stack, Understand the overall architecture of Ambari, and Ambari's relation to other services and components of a Hadoop cluster, List the functions of the main components of Ambari, Explain how to start and stop services from Ambari Web Console, Managie Hadoop clusters with Apache Ambari, Start the Apache Ambari web console and perform basic start/stop services, Explore other aspects of the Ambari web server.

Unit 2: Hadoop and HDFS

Understand the basic need for a big data strategy in terms of parallel reading of large data files and internode network speed in a cluster, Describe the nature of the Hadoop Distributed File System (HDFS), Explain the function of the NameNode and DataNodes in an Hadoop cluster, Explain how files are stored and blocks ("splits") are replicated, File access and basic commands with HDFS, Describe the MapReduce model v1, List the limitations of Hadoop 1 and MapReduce 1, Review the Java code required to handle the Mapper class, Reducer class, and the program driver needed to access MapReduce, Describe the YARN model, Compare Hadoop 2/YARN with Hadoop 1, Run MapResuce and YARN jobs, Create and code a simple MapReduce job, Understand the nature and purpose of Apache Spark in the Hadoop ecosystem, List and describe the architecture and components of the Spark unified stack, Describe the role of a Resilient Distributed Dataset (RDD), Understand the principles of Spark programming, List and describe the Spark libraries, Launch and use Spark's Scala and Python shells, Work with Spark RDD with Scala, List the characteristics of representative data file formats, including flat/text files, CSV, XML, JSON, and YAML, List the characteristics of the four types of NoSQL datastores, Describe the storage used by HBase in some detail, Describe and compare the open source programming languages, Pig and Hive, List the characteristics of programming languages typically used by Data Scientists: R and Python, Use Hive to access Hadoop/HBase data, Understand the challenges posed by distributed applications and how ZooKeeper is designed to handle them, Explain the role of ZooKeeper within the Apache Hadoop

infrastructure and the realm of Big Data management, Explore generic use cases and some real-world scenarios for ZooKeeper, Define the ZooKeeper services that are used to manage distributed systems, Explore and use the ZooKeeper CLI to interact with ZooKeeper services, Understand how Apache Slider works in conjunction with YARN to deploy distributed applications and to monitor them, Explain how Apache Knox provides peripheral security services to an Hadoop cluster, Connect to ZooKeeper and explore the ZooKeeper files, List some of the load scenarios that are applicable to Hadoop, Understand how to load data at rest, Understand how to load data in motion, Understand how to load data from common sources such as a data warehouse, relational database, web server, or database logs, Explain what Sqoop is and how it works, Describe how Sqoop can be used to import data from relational systems into Hadoop and export data from Hadoop into relational systems, Brief introduction to what Flume is and how it works, Move data into HDFS with Sqoop, Explain the need for data governance and the role of data security in this governance, List the Five Pillars of security and how they are implemented with HDP, Discuss the history of security with Hadoop, Identify the need for and the methods used to secure Personal & Sensitive Information, Describe the function of the Hortonworks DataPlane Service (DPS), Define streaming data, Describe IBM as a pioneer in streaming data - with System S èIBM Streams, Explain streaming data - concepts & terminology, Compare and contrast batch data vs streaming data, List and explain streaming components & Streaming Data Engines (SDEs).

Unit 3: Introduction to Data Science

Have a better understanding of methodology "scientific approach" methods used & skills practiced by Data Scientists , Recognize the iterative nature of a data science project, Outline the benefits of using Data Science Notebooks, Describe the mechanisms and tools used with Data Science Notebooks, Compare and contrast the major Notebooks used by Data Scientists, Getting started with Jupyter Notebook, Data and notebooks in Jupyter, How notebooks help data scientists, Essential packages: NumPy, SciPy, Pandas, Scikit-learn, NLTK, Beautiful Soup, Data visualizations: matplotlib, …, PixieDust, Using Jupyter "Magic" commands, Start Jupyter - it will open in a web browser, Import the lab file (all Jupyter files have a.ipynb suffix) into your default workspace, This is now a copy of the provided lab file and you can do anything with it o If you mess it up, you can re-import again later, Explore the component panels - some are markdown, some are code, some are results of running the code (output data, visualizations, …), Learn how to run single panels - and then the whole script o You may need to adjust the provided script to locate the data files thataccompany the Jupyter.ipynb file o Add some additional panels, as described in the lab script.

Unit 4: Big SQL

Overview of Big SQL, Understand how Big SQL fits in the Hadoop architecture, Start and stop Big SQL using Ambari and command line, Connect to Big SQL using command line, Connect to Big SQL using IBM Data Server Manager, Configure images, Start Hadoop components, Start up the Big SQL and DSM services, Connect to Big SQL using JSqsh, Execute basic Big SQL statements, Explore Big SQL through Ambari using DSM, Describe and create Big SQL schemas and tables, Describe and list the Big SQL data types, Work with various Big SQL DDLs, Load data into Big SQL tables using best practices, Create and drop simple Big SQL table, Create sample tables, Move data into HDFS, Load data into Big SQL tables, Create and work with views, Create external tables, Describe Big SQL supported file formats, Query Big SQL tables using various DMLs, Connect to Big SQL, Query data with Big SQL, Work with the ARRAY type, Work with Big SQL functions, Store data in an alternate file format (Parquet), Configure the Big SQL Server, Configure the Big SQL Scheduler, List the registries for compiler and runtime performance improvement, Backup and restore Big SQL, Update the database resource percentage for the Big SQL database instance, Inspect the Big SQL scheduler configuration file, View the registries for the compiler

and runtime performance improvement, Configure authentication for Big SQL, Manage security with Apache Ranger, Enable SSL encryption, Configure authorization of Big SQL objects, Configure impersonation in Big SQL, Understand the concept of Big SQL federation, List the supported data sources, Set up and configure a federation server to use different data sources, Configure Fluid Query with Big SQL.

Unit 5: IBM Watson Studio

Define a package dependency, Create an Express server object, Handle inbound HTTP method calls for a server resource, and Create a callback function to intercept HTTP method calls. Parse JSON data from an HTTP message-, Create a Hello World Express application, Create Simple HTML view for your application, Understand Express routing, Use third-party modules in Node.js.

Understand the Watson Natural Language Understanding service Clone a cloud application, Use Bootstrap to create a responsive web page, Use AngularJS, Controllers to create interactive web pages, Use AngularJS Services to, interact with back-end web services Use AngularJS directives, such as ng- repeat, to enrich your user interface (UI).

Learning Outcomes:

Having successfully completed this course, the student can:

1. Big Data and Data Analytics
2. Hortonworks Data Platform (HDP)
3. Apache Ambari
4. Hadoop and the Hadoop Distributed File System
5. MapReduce and Yarn
6. Apache Spark
7. Storing and Querying data

Reference Book:

1. IBM COURSEWARE.

Department of Computer Science & Engineering
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Batch: 2016-20

Course Title**: PREDICTIVE ANALYSIS MODELER**	Course Code: **DL7210**
Credit: **4**	L T P **3 0 2**
Year: **4th**	Semester: **VII**

Course Objective:

The Predictive Analytics Modeler career path prepares students to learn the essential analytics models to collect and analyze data efficiently. This will require skills in predictive analytics models, such as data mining, data collection and integration, nodes, and statistical analysis. The Predictive Analytics Modeler will use tools for market research and data mining in order to predict problems and improve outcomes.

Unit 1 – Business Analytics Overview

Understand how analytics is transforming the world, Understand the profound impact of analytics in business decisions, Understand what is analytics and how it works, Understand why business analytics has become important in various industries, Understand the history of analytics and how it has changed today, Understand how to analyze unstructured data , Understand how analytics is making the world smarter, Understand where the future of analytics lies, Explain why successful enterprises need business analytics, Understand how business analytics can help turn data into insight, Understand how predictive analytics is transforming all types of organizations, Explain how analytics supports retail companies, Understand how analytics can reduce crime rates and accidents, Explain the use of analytics in law enforcement and insurance companies, Understand how analytics can affect the future of education, Understand the importance of business analytics, Comprehend how big data and analytics can help in understanding consumer/customer behavior, Explain how analytics can help manage assets, Understand how analytics can help combat fraud ,Explain how analytics can help us to understand social sentiments, Explain what is analytics , Define various types of analytics, Demonstrate how to apply analytics, Describe business intelligence ,Demonstrate how to apply business intelligence

Unit 2: Introduction to a Predictive Analytics Platform & Data Mining

List two applications of data mining, Explain the stages of the CRISP-DM process model ,Describe successful data-mining projects and the reasons why projects fail, Describe the skills needed for data mining, Understand data mining , Describe how to apply data mining in different scenarios, Describe the MODELER user-interface , Work with nodes , Run a stream or a part of a stream ,Open and save a stream ,Use the online Help, Create streams , Change streams, Generate a select node from the Table output, Create a stream that reads data and exports data to Microsoft Excel, Change and save a stream., Create a new stream from an existing stream, Make a stream neat using a SuperNode, Explain the basic framework of a data-mining project, Build a model , Deploy a model, Build a model using historical data, Deploy the model, Explore the data, Select modeling data , Build a CHAID model, Interpret of the fields added by model nugget, Explore the results, Explain the concepts of data structure, unit of analysis, field storage and field measurement level, Import Microsoft Excel files , Import text files Import from databases , Export data to various formats, Import a Microsoft Excel file , Import a text file , Set fields' measurement levels, Import data

Determine the unit of analysis , Determine relationships between datasets ,Set measurement levels, Audit the data , Explain how to check for invalid values , Take action for invalid values , Explain how to define blanks, Audit the data ,Define valid values and take action , Declare blank values, Explore the data , Set ranges and take action , Declare blanks, Set the unit of analysis by removing duplicate records, Set the unit of analysis by aggregating records , Set the unit of analysis by expanding a categorical field into a series of flag fields, Cleanse data by removing duplicate records , Expand a categorical field into a series of flag fields, Remove duplicate records , Create a dataset where customers are unique in a company's purchases data ,Create a dataset where customers are unique in a company's order lines data , Create a dataset where customers are unique in a company's mailing history data, Integrate data by appending records from multiple datasets , Integrate data by merging fields from multiple datasets , Sample records, Append records from two datasets, Merge fields from different datasets, Enrich a dataset with aggregated data , Sample records

Create single datasets, Enrich the data with zipcode information, Export a random sample, Use the Control Language for Expression Manipulation (CLEM), Derive new fields, Reclassify field values, Cleanse data and derive fields for modeling, Cleanse data and reclassify fields for modeling, Compute the difference between amount spent and credit limit , Compute fields in a currency from a different currency, Create a segment field

Create a field returning the bonus, Examine the relationship between two categorical fields, Examine the relationship between a categorical field and a continuous field, Examine the relationship between two continuous fields, Assess the relationship between churn and handset , Assess the relationship between churn and number of dropped calls , Assess the relationship between number of products and revenues, Examine the relationship between response and other factors in the dataset, List three modeling objectives Use a classification model , Use a segmentation model, Predict churn by running a CHAID model ,Predict churn by running a Neural Net model , Compare the accuracy of these models, Find groups of similar customers, based on usage, Build a CHAID model to predict response, Assess the model's accuracy , Apply the model to other customers, Use the two step segmentation model to cluster records.

Unit 3: Advanced data preparation

Use date functions , Use conversion functions , Use string functions , Use statistical functions , Use missing value functions, Use the date functions to derive fields , Use string functions to derive fields, Use statistical functions to derive fields, Use missing value functions to derive fields, Import and instantiate the data ,Compute an AGE field , Conditionally compute the sum over a series of fields, Derive a field taking blank values into account, Use the Filler node to replace values, Use the Binning node to recode continuous fields Use the Transform node to change a field's distribution, Use the Filler node to change storage , Use the Filler node to replace null values , Use the Filler node to replace strings , Do binning with equal counts, Do binning using a supervisor field, Import and instantiate the data , Correct spelling, Replace blanks with undefined values , Bin a field optimally with respect to target , Transform a field to change its distribution, Use cross-record functions , Use the Count mode in the Derive node Use the Restructure node to expand a continuous field into a series of continuous fields, Use the Space-Time-Boxes node to work with geospatial and time data

Create a record identifier , Move an average , Restructure a transactional dataset, Use the Space-Time-Boxes node, Import the data Derive a record identifier , Restructure the dataset , Analyze geospatial and time data

Use the Sample node to draw simple and complex samples , Partition the data into a training and a testing set, Reduce or boost the number of records, Draw a simple sample and a complex sample , Partition data into a training set and a testing set, Balance the data, Import the data, instantiate the data and examine the response , Draw a random sample, Draw a stratified sample , Prepare for modeling by using a Type node, Run models on the training set and select the best model, Use database scalability by SQL pushback, Use the Data Audit node to process outliers and missing values, Use the Set Globals node, Use parameters , Use looping and conditional execution, Use the Data Audit node to process outliers, extremes and missing values, Compute standardized scores using globals, Use parameters , Create a loop through values, Import and instantiate the data, Use globals to replace undefined values with the mean , Create a loop through the row fields in the Matrix node

Unit 4: Automated Data Mining:

Describe the featured included with modeler to automate data mining, Describe the phases of the CRISP-DM process model for data mining, Use the modeler interface , Describe the components of the modeler user interface , Place nodes on the stream canvas , Connect and disconnect nodes, Edit and rename codes, Create nodes , Create streams, Read a statistics data file into modeler , Use a statistics file node to read a statistics data file , Use the filter tab to filter and rename fields , Use the types tab to view measurement level and set field role , Save a modeler stream file, Read a data file, Type the data in the source node, Review and explore data to look at data distributions , Identify data problems, including missing values , Describe the types of missing values for fields , Set missing values for fields, Use the data audit node to explore data distributions, Use the data audit node to impute missing data , Use the table node to view the data file, Edit the source node, Identify what types of blank values are defined for fields , Add a data audit node to the stead, Review missing values, Use the automated data prep node to further prepare data modeling , Use the type node to set characteristics for fields , Describe the various features and capabilities of the automated data prep node Use settings of the automated data prep node that are appropriate for the data and modeling

objectives, Describe the types of output produced by the automated data prep node, Add an ADP node to the stream, Edit the ADP node, Run analysis on the ADP node.

Unit 5: Data Partitioning and Deploying Models

Use a partition node to create training and testing data subsets, Describe rationale and use of a partition node to create data subsets , Set sizes of the training and testing partitions and other partition characteristics , Use a distribution node to view the distribution of a categorical field, Use a partition node to create training and testing data subsets , Describe rationale and use of a partition node to create data subsets , Set sizes of the training and testing partitions , Use a distribution node to view the distribution of a categorical field, Use the feature selection node to select inputs for modeling , Describe the features and settings of the feature selection node , Describe the model output from feature selection, Generate a filter node to use the selected fields, Use the feature selection node to select fields, Predict a response, Describe the features and settings of the auto classifier node , Describe and use the components of the model output from the auto classifier node, Use the auto classifier node to construct a model in order to predict a response, Use the analysis mode to get a summary of predictions, Use the select node to analyze the testing partition data, Use a matrix node to examine the percent accuracy of predictions, Use a distribution node to graphically display the relationship between a categorical prediction and the target , Use a histogram node to graphically display the relationship between a continuous predictor and the target., Use an analysis node to evaluate model predictions, Use a distribution node to evaluate model predictions, Use a histogram node to evaluate model predictions, Describe and use the features of the auto numeric node , Describe and use the components of the model output from the auto numeric node, Use various nodes for model evaluation Add an auto numeric node to the stream, Use an analysis node to evaluate the auto numeric model, Describe what needs to be modified to create a scoring stream for new data , Describe the deployment options in modeler , Export scored data to another file format, Use a scoring stream to make predictions.

Learning Outcomes:

Having successfully completed this course, the student can:

1. The importance of analytics and how its transforming the world today
2. Understand how analytics provided a solution to industries using real case studies
3. Explain what is analytics, the various types of analytics, and how to apply it
4. Improve efficiency, sample records, and work with sequence data
5. Explain data transformations, and functions

Reference Book:

1. IBM COURSEWARE.

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Big Data & Analytics
Batch: 2016-20

Course Title**: ADVANCED RDBMS**	Course Code: **DK7250**
Credit: **4**	L T P **3 0 2**
Year: **4th**	Semester: **VII**

Unit I **(8 L)**

RDBMS: Entity –Relationship model – Relational Model – Relational constraints- Relational algebra ,Tuples and Domain Relational calculus, Database Administrator, Introduction to SQL, Data Definition Language, Data Manipulation Language, Data Control Language, Queries, Join, Functions, Operators, Invoking SQL *Plus, Commit, Rollback, Normal forms, ER Diagram, mapping.

Unit II **(8 L)**

Introduction to Pl/SQL, Control Statements, View, Indexes, Sequences, PL/SQL Cursor, Database Trigger, Function, Procedure, Exceptional Handling in Oracle 11i**.**

Unit III **(7 L)**

Query processing and optimization-Transactions-Properties of Transactions-Concurrency Control, Recovery, Security and Authorization, Storage-Indexing and Hashing, B+ Trees, Trees-X Trees, Dynamic Hashing .

Distributed Databases-Principles –Design-Queries Translation of queries optimization Access Strategies, Management of Distributed Transactions actions-concurrency Control-Reliability .

Unit IV **(7 L)**

Object Oriented Concepts-Data Object Models-Object Based Databases –Object Oriented Databases-Object Oriented Databases Relational Databases-Object Definition Languages-Object Query Languages-SQL3-Concurreency in OODBs-Storage and Access Data Access .

Unit V **(6 L)**

Other Database Models-Multimedia Databases-Parallel Databases Data Mining - Data Warehousing –Spatial Databases Concepts –Temporal Databases Concepts-Active Databases.

Text Book:

1. Fred R. McFadden, Jeffery A. Hoffer, Mary B. ,Modern Database Management, Prescott, Fifth Edition , Edition Wesley, 2000 .
2. Elmasri, Navathe, ,Fundamentals Of Database Systems, Third Edition,Addison Wesley, 2000 .
3. Abraham Silberchartz, Henry F. Korth, S. Sudarshan, Database System Concepts ,Third Edition, McGraw-Hill, 1996 .

Reference Book:

1. Jefry D. Ullman , Jenifer Widom ,A First Course in Database Systems, Pearson Education Asia, 2001 .
2. Stefano Ceri, Giuseppe Pelagatti, Distributed Databases Principles & Systems, McGraw-Hill International Editions, 1985
3. Rajesh Narang, Object Oriented Interfaces & Databases, Prentice Hall Of India, 2002 .

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Big Data & Analytics
Batch: 2016-20

Course Title**: BUSINESS INTELLIGENCE**	Course Code: **DA8010**
Credit: **3.5**	L T P **3 1 0**
Year: **4th**	Semester: **VIII**

Unit I

Introduction to Business Intelligence,

Introduction to OLTP and OLAP, BI Definitions & Concepts, Business Applications of BI, BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities

Unit II

Basics of Data Integration (**E**xtraction **T**ransformation **L**oading)**,**

Concepts of data integration need and advantages of using data integration, introduction to common data integration approaches, introduction to ETL using SSIS, Introduction to data quality, data profiling concepts and application

Unit III

Introduction to Multi-Dimensional Data Modeling**,**

Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi dimensional modeling, concepts of dimensions, facts, cubes, attribute, hierarchies,

Unit IV

Star and snowflake schema, introduction to business metrics and KPIs, creating cubes using SSAS

Unit V

Basics of Enterprise Reporting**,**

Introduction to enterprise reporting, concepts of dashboards, balanced scorecards, introduction to SSRS Architecture, enterprise reporting using SSRS

Text Book:

1. David Loshin ,Business Intelligence.
2. Mike Biere ,Business intelligence for the enterprise .
3. Larissa Terpeluk Moss, Shaku Atre ,Business intelligence roadmap.

Reference Book:

1. Cindi Howson ,Successful Business Intelligence: Secrets to making Killer BI Applications .
2. Brain, Larson ,Delivering business intelligence with Microsoft SQL server 2008 .

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Big Data & Analytics
Batch: 2016-20

Course Title**: REAL TIME SYSTEMS**	Course Code: **DA8040**
Credit: **3.5**	L T P **3 1 0**
Year: **4th**	Semester: **VIII**

UNIT-I: Introduction
Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

UNIT-II: Real Time Scheduling
Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III: Resources Access Control
Effect of Resource Contention and Resource Access Control (RAC), Nonpreemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

UNIT-IV: Real Time Communication
Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols

UNIT-V: Real Time Operating Systems and Databases
Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases

Text Book:

1. Jane W. S. Liu, "Real Time Systems", Pearson Education Publication.
2. Albert M. K. Cheng, "Real-Time Systems: Scheduling, Analysis, and Verification ,John Wiley and Sons Publications.

Reference Book:

1. Mall Rajib," Real Time Systems" Pearson Education

Department of Computer Science & Engineering
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Batch: 2016-20

Course Title**: CYBER LAW & IPR**	Course Code: **DA8050**
Credit: **3**	L T P **3 0 0**
Year: **4th**	Semester: **VIII**

UNIT I - FUNDAMENTALS OF CYBER SECURITY

Introduction-Cyber Security and its problem-Intervention Strategies: Redundancy, Diversity and Autarchy.

UNIT II – ISSUES IN CYBER SECURITY

Private ordering solutions, Regulation and Jurisdiction for global Cyber security, Copy Right-source of risks, Pirates, Internet Infringement, Fair Use, postings, criminal liability, First Amendments, Data Loss.

UNIT III – INTELLECTUAL PROPERTY RIGHTS

Copy Right-Source of risks, Pirates, Internet Infringement, Fair Use, postings, Criminal Liability, First Amendments, Losing Data, Trademarks, Defamation, Privacy-Common Law Privacy, Constitutional law, Federal Statutes, Anonymity, Technology expanding privacy rights.

UNIT IV - PROCEDURAL ISSUES

Duty of Care, Criminal Liability, Procedural issues, Electronic Contracts & Digital Signatures, Misappropriation of information, Civil Rights, Tax, Evidence.

UNIT V-LEGAL ASPECTS OF CYBER SECURITY

Ethics, Legal Developments, Late 1990 to 2000,Cyber security in Society, Security in cyber laws case. studies, General law and Cyber Law-a Swift Analysis.

Text Book:

1. Jonathan Rosenoer, *"Cyber Law: The law of the Internet"*, Springer-Verlag,1997.

Reference Book:

1. Mark F Grady, Fransesco Parisi, "*The Law and Economics of Cyber Security"*, Cambridge University Press, 2006.

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Big Data & Analytics
Batch: 2016-20

Course Title**: DIGITAL IMAGE PROCESSING**	Course Code: **DA7640**
Credit: **4**	L T P **3 0 2**
Year: **4th**	Semester: **VII**

Unit I : **Introduction and Fundamentals:** Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.
Image Enhancement in Spatial Domain: Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

Unit II : **Image Enhancement in Frequency Domain:** Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.
Image Restoration: A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

Unit III : **Color Image Processing:** Color Fundamentals, Color Models, Converting Colors to different models, Color Transformation, Smoothing and Sharpening, Color Segmentation.
Morphological Image Processing: Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening.

Unit IV : **Registration:** Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth
Segmentation: Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Regionbased Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

Unit V : **Feature Extraction:** Representation, Topological Attributes, Geometric Attributes.
Description: Boundary-based Description, Region-based Description, Relationship.
Object Recognition: Deterministic Methods, Clustering, Statistical Classification, Syntactic Recognition, Tree Search, Graph Matching.

Text Book:

Rafael C. Gonzalvez and Richard E.Woods., Digital Image Processing 2nd Edition, Pearson Education.
2. R.J. Schalkoff. ,Digital Image Processing and Computer Vision, John Wiley and Sons, NY.

Reference Book:

1. A.K. Jain. , Fundamentals of Digital Image Processing, Prentice Hall, Upper Saddle River, NJ.

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Big Data & Analytics
Batch: 2016-20

Course Title**: ADVANCED COMPUTER NETWORK**	Course Code: **DA7650**
Credit: **4**	L T P **3 0 2**
Year: **4th**	Semester: **VII**

UNIT I ***(8L)***

Network Design: Design Principles, Determining Requirements, Analysing the Existing Network, Preparing the Preliminary Design, Completing the Final Design Development, Deploying the Network, Monitoring and Redesigning, Maintaining, Design Documentation, Cisco PDIOO Model, Modular Network Design, Hierarchical Network Design, The Cisco Enterprise Composite Network Model.

UNIT II ***(8L)***

Router Design: Configuring a Router, Routing Protocols, **Switching Design**: Switching Types, Layer 2 and 3 Switching, Multilayer Switching, Cisco Express Forwarding, Switching Security, Multi-Protocol Label Switching (MPLS), MPLS Architecture and related protocols. **IPv4 Routing Design**: IPv4 Address Design, Private and Public Addresses ,NAT, Subnet Masks, Hierarchical IP Address Design, Deploying IPv6 in Campus Networks,

UNIT III ***(8L)***

Wireless LAN Design: Wireless Technology Overview, Wireless Standards, Wireless Components, Wireless Security, Wireless Security Issues, Wireless Threat Mitigation, Wireless Management, Wireless Design Considerations, IEEE 802.11, Wireless Standard, Cellular Networks, Mobile IP, Wireless Mesh Networks(WMNs), QoS Models: IntServ, DiffServ154, QoS Tools, Policing and Shaping, Congestion Avoidance, Congestion Management, Link- Specific Tools, QoS Design Guidelines.

UNIT IV ***(8L)***

Optical Networks: Benefits of Optical Networks, Optical Network Drivers, Component Applications, Design and Planning, Restoration, Network Management, WDM System, All-Optical Network, Optical Layer Services and Interfacing.

UNIT V ***(8L)***

Network Security and Management Design: Hacking: Vulnerabilities, Threats: Reconnaissance Attacks, Access Attacks, Information Disclosure Attacks, Denial of Service Attacks, Threat Defence Secure Communication, Network Security Best Practices, SAFE Campus Design.

ISO Network Management Standard: Protocols and Tools, SNMP, MIB, RMON, Cisco NetFlow, Syslog, Network Management Strategy: SLCs and SLAs, IP Service-Level Agreements, Content Networking Design.

Text Book:

1. Diane Tiare and Catherine Paquet, "Campus Network Design Fundamentals", Pearson Education, 2006.
2. Rajiv Ramaswami, Kumar N Sivarajan, Galen H Sasaki, "Optical Networks, A Practical Perspective", 3rd Edition, Elsevier, 2010.

Reference Book:

1. Craig Zacker, "The Complete Reference: Upgrading and Troubleshooting Networks", Tata McGraw-Hill, 2000.

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Big Data & Analytics
Batch: 2016-20

Course Title: **STATISTICAL MACHINE LEARNING**			Course Code: **DA7670**
Credit: **4**	L **3**	T **0**	P **2**
Year: **4th**			Semester: **VII**

Unit I **Introduction:** Probability Theory, Overview of supervised learning, Curse of dimensionality, Decision theory, Information theory, Minimax theory, Parametric versus non-Parametric methods, Bayesian versus non-Bayesian approaches, Classification, Regression, Density estimation, Bias-variance, Lasso, MLE.

Unit II **Parametric and Nonparametric Methods:** Linear regression, Model selection, Generalized linear models, Classification, Structured prediction, Hidden Markov models; Regression: Linear smoothers, Variance estimations, Confidence bands, Average coverage, Space-scale smoothing, Multiple regression; Density estimation: Cross-validation, Histograms, Kernel density estimation, Local polynomials, Classification, Bootstrap and sub-sampling, Nonparametric Bayes.

Unit III **Kernel Methods and Machines:** Dual representations, Kernel construction, Selecting the width of the kernel, Kernel density estimation and classification, Radial basis functions and kernel, Gaussian processes, Maximum margin classifiers, Relevance vector machines.

Unit IV **Graphical and Mixture Models:** Bayesian networks: Generative models, Linear-Gaussian models; Conditional independence: D-separation; Markov random fields: Factorization properties, Relation to directed graphs; Inference in graphical models: Inference on a chain, Trees, Factor graphs, Sum-product & max-sum properties, Loopy belief propagation; K-means clustering, Mixtures of Gaussians, EM, An alternative view of EM.

Unit V **Other Learning Methods:** Unsupervised learning, Semi-supervised learning, Reinforcement learning, Ensemble learning, Online learning, Active learning.

Text Book

1. Bishop C. M., Pattern Recognition and Machine Learning, Springer (2006), 1st ed.
2. Hastie T., Tibshirani R., Friedman J., The Elements of Statistical Learning, Springer (2008), 2nd ed.

Reference Book

1. Wasserman L., All of Statistics: A Concise Course in Statistical Inference, Springer (2010), 1st ed.
2. Devroye L., Gyorfi L., Lugosi G., A Probabilistic Theory of Pattern Recognition, Springer, (1996), 1st ed.

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Big Data & Analytics
Batch: 2016-20

Course Title**: COMPUTER VISION**	Course Code: **DA8630**
Credit: **3**	L T P **3 0 0**
Year: **4th**	Semester: **VIII**

Unit I

Introduction: What is computer vision, The Marr paradigm and scene reconstruction, Other paradigms for image analysis. Image Formation, Image Geometry, Radiometry, Digitization.

Unit II

Binary Image Analysis and Segmentation: Properties, Digital Geometry, Segmentation.

Unit III

Image Processing for Feature Detection and Image Synthesis, Edge detection, corner detection Line and curve detection, SIFT operator, Image-based modelling and rendering, Mosaics, snakes.

Unit IV

Stereo: Shape from shading, Photometric stereo, Texture, Occluding contour detection, Motion Analysis: Motion detection and optical flow Structure from motion

Unit V

Object recognition: Hough transforms and other simple object recognition methods, Shape correspondence and shape matching ,Principal component analysis ,Shape priors for recognition

Text Book:

1. D. Forsyth and J. Ponce, *Computer Vision - A modern approach,* Prentice Hall *Robot Vision,* by B. K. P. Horn, McGraw-Hill.

Reference Book:

1. E. Trucco and A. Verri *,Introductory Techniques for 3D Computer Vision,* Publisher: Prentice Hall

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Big Data & Analytics
Batch: 2016-20

Course Title**: SOFTWARE TESTING**	Course Code: **DA8650**
Credit: **3**	L T P **3 0 0**
Year: **4th**	Semester: **VIII**

Unit I **(8 L)**

Introduction: Terminology, evolving nature of area, Errors, Faults and Failures, Correctness and reliability, Testing and debugging, Static and dynamic testing, Exhaustive testing: Theoretical foundations: impracticality of testing all data, impracticality of testing all paths, no absolute proof of correctness.

Unit II **(8 L)**

Software V & V Approaches and their Applicability: Software technical reviews; Testing techniques and their applicability -functional testing and analysis, structural testing and analysis, error-oriented testing and analysis, hybrid approaches, integration strategies, transaction flow analysis, stress analysis, failure analysis, concurrency analysis, performance analysis; Proof of correctness; simulation and prototyping; Requirement tracing.

Unit III **(8 L)**

Software Testing: Levels of Testing, Functional Testing, Structural Testing, Test Plan, Test Case Specification, Software Testing Strategies, Verification & Validation, Unit, Integration Testing, Top Down and Bottom Up Integration Testing, Regression and Stress Testing , Alpha & Beta Testing, White box and black box testing techniques, System Testing and Debugging.

Unit IV **(8 L)**

Test Generation: Test generations from requirements, Test generation pats, Data flow analysis, Finite State Machines models for flow analysis, Regular expressions based testing, Test Selection, Minimizations and Prioritization, Regression Testing.

Unit V **(8 L)**

Program Mutation Testing: Introduction, Mutation and mutants, Mutation operators, Equivalent mutants, Fault detection using mutants, Types of mutants, Mutation operators for C and Java.

Text Book:

1. Boris Beizer, Software Testing Techniques, John Wiley & Dreamtech (2002).
2. William Perry, Effective Methods for Software Testing, John Wiley & Sons, Inc. (2006) 3rd ed.
3. Aditya P. Mathur, Foundations of Software Testing, Pearson Education (2008).

Reference Book:

1. Glenford J. Myers, The Art of Software Testing, Wiley India Pvt. Ltd 2nd edition (2006) 2nd ed.
2. Roger S. Pressman, Software Engineering, A Practitioner's Approach, McGrawHill International Edition (2009) 7th edition.
3. Ian Sommerville, Software Engineering, Addison-Wesley Publishing Company, (2006) 8th ed.

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Big Data & Analytics
Batch: 2016-20

Course Title: **MACHINE LEARNING & NEURAL NETWORKS**			Course Code: **DA8670**
Credit: **3**	L **3**	T **0**	P **0**
Year: **4th**			Semester: **VIII**

Unit I **Introduction:** Well-Posed learning problems, Basic concepts, Designing a learning system, Issues in machine learning. Types of machine learning: Learning associations, Supervised learning (Classification and Regression Trees, Support vector machines), Unsupervised learning (Clustering), Instance-based learning (K-nearest Neighbor, Locally weighted regression, Radial Basis Function), Reinforcement learning (Learning Task, Q-learning, Value function approximation, Temporal difference learning).

Unit II **Decision Tree Learning:** Decision tree representation, appropriate problems for decision tree learning, Univariate Trees (Classification and Regression), Multivariate Trees, Basic Decision Tree Learning algorithms, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

Unit III **Artificial Neural Network:** Perceptron learning, Pattern Classification. Hebb Rule. Adaline. Madaline. Delta Rule. Perceptron, Training a perceptron, Multilayer perceptron, Back propagation learning, Competitive learning, Hebbian learning, BAMs.

Unit IV **Supervised and Unsupervised learning**: Supervised and Unsupervised learning Reinforcement learning, Kohonen Self Organizing Maps, Adaptive Resonance Theory, Neural Network Applications. Recurrent Networks, Dynamically modifying network structure, .Support Vector Machines

Unit V **Inductive and Analytical Learning:** Learning rule sets, Comparison between inductive and analytical learning, Analytical learning with perfect domain theories: Prolog-EBG. Inductive-Analytical approaches to learning, Using prior knowledge to initialize hypothesis (KBANN Algorithm), to alter search objective (TangentProp and EBNN Algorithm), to augment search operators (FOCL Algorithm).

Text Book

1. Mitchell T.M., Machine Learning, McGraw Hill (1997) 2nd ed.
2. Alpaydin E., Introduction to Machine Learning, MIT Press (2010) 2nd ed.

Reference Book

1. 1. Bishop C., Pattern Recognition and Machine Learning, Springer-Verlag (2006) 2nd ed.

Department of Computer Science & Engineering

Detailed Syllabus for B.Tech. (CSE-CCV)

Batch: 2016-20

DIT UNIVERSITY

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Course Structure & Detailed Syllabus

of

B.Tech. in Computer Science & Engineering

Cloud Computing & Virtualization (IBM)

Batch 2016-20

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cloud Computing
Batch: 2016-20

Year: 1st **Semester: I**

Group A

Course Code	Course Title	L	T	P	Credits
JA1010	Engineering Mathematics-I	3	1	0	3.5
OA1210	Engineering Physics	3	1	2	4.5
LA1210	Essentials of Mechanical Engineering	3	1	2	4.5
HA1210	Professional Communication-I	3	0	1	3.5
DK1210	Software Foundation & Programming using C	3	0	2	4
BA1010	Environmental Science	2	0	0	2
LA1220	Engineering Graphics	1	0	0	1
HA1310	Soft Skills Development	0	0	2	1
	Total				**24**

Year: 1st **Semester: II**

Course Code	Course Title	L	T	P	Credits
JA2010	Engineering Mathematics-II	3	1	0	3.5
BA1210	Engineering Chemistry	3	1	2	4.5
EA1210	Introduction to Electrical Engineering	3	1	2	4.5
FA1210	Introduction to Electronics & Communication	3	1	2	4.5
HA2210	Professional Communication-II	3	0	1	3.5
DK2210	Software Foundation & Programming using C++	3	0	2	4
LA1110	Workshop Practice	0	0	2	1
	Total				**25.5**

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Year: 2nd **Semester: III**

Course Code	Course Name	L	T	P	Credits
DA3210	Data Structures	3	0	2	4
DA3220	Computer Based Numerical and Statistical Techniques	3	0	2	4
DK3210	Essentials of OOP using Java	3	0	2	4
DA3010	Discrete Mathematics	3	1	0	3.5
DA3020	Computer Organization	3	1	0	3.5
FA3221	Digital System Design	3	1	2	4.5
	Total				**23.5**

Year: 2nd **Semester: IV**

Course Code	Course Name	L	T	P	Credits
DA4010	Theory of Computation	3	1	0	3.5
FA52A0	Microprocessors	3	1	2	4.5
DA4210	Computer Networks	3	0	2	4
DA4220	Web Technology	3	0	2	4
DK4250	Information Management Basics (T3)	3	0	2	4
DA4242	Linux Administration & Shell Programming	3	0	2	4
DK4110	Industry Session on Emerging Technology in Cloud Computing	0	0	2	1
DA4310	Value Addition Training	0	0	2	1
DA4410	Industrial Tour	0	0	2	1
	Total				**27**

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Year: 3rd **Semester: V**

Course Code	Course Name	L	T	P	Credits
JA5010	Probability & Random Variables	3	1	0	3.5
DA5020	Operating System	3	1	0	3.5
DA5211	Algorithms: Analysis & Design	3	0	2	4
DK5210	Cloud Application Development	3	0	2	4
DA5230	Artificial Intelligence	3	0	2	4
HA5010	Principles of Management	2	0	0	2
DA5310	Aptitude Building – I	0	0	2	1
	Total				**22**

Year: 3rd **Semester: VI**

Course Code	Course Name	L	T	P	Credits
DA6210	Computer Graphics	3	0	2	4
DA6220	Dot Net Technologies	3	0	2	4
DA6230	Compiler Design	3	0	2	4
DK6050	Essentials of Software Engg. (OOAD & SW Lifecycle) (T3)	3	0	0	3
GC5010	Engineering Economics	2	1	0	2
	Elective –I	3	0	0	3
DK6210	Intelligent Systems	3	0	2	4
DA6310	Aptitude Building – II	0	0	2	1
DK6110	Project-GRM	0	0	4	2
	Total				**27.5**

After VI semester student will undergo minimum 6 weeks Industrial Training which will be evaluated in the VII semester.

List of Elective Subjects for VI Semester

Elective – I			
DA6640	Mobile Computing	DA6650	Data Base Administration
DA6620		Genetic Algorithms & Probabilistic Reasoning	

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Year: 4th **Semester: VII**

Course Code	Course Name	L	T	P	Credits
DA7010	Distributed Computing	3	1	0	3.5
DA7020	Advanced Computer Architecture	3	1	0	3.5
DA7210	Cryptography and Network Security	3	0	2	4
DA7030	Data Warehousing and Mining	3	1	0	3.5
DK7210	Business Process Management	3	0	2	4
DK8210	**Blockchain**	**3**	**0**	**2**	**4**
DK7250	Advanced RDBMS	3	0	2	4
DA7510	Industrial Training and Presentation*	0	0	8	4
DK7110	**Project-GRM**	**0**	**0**	**4**	**2**
	Total				**32.5**

Note: * The student shall undergo 'Industrial Training' during Summer Vacations and shall prepare the Report and Make a Presentation during this semester.

Year: 4th **Semester: VIII**

Course Code	Course Name	L	T	P	Credits
DA8010	Business Intelligence	3	1	0	3.5
DA8040	Real Time Systems	3	1	0	3.5
DA8050	Cyber Law & IPR	3	0	0	3
	Elective – III	3	0	0	3
	Elective -II	3	0	2	**4**
	Open Elective	3	0	0	3
DK8110	Project-GRM	0	0	8	4
	Total				**24**

List of Elective Subjects for VIII Semester

Elective-II	
DA7640	Digital Image Processing
DA7650	Advanced Computer Networks
DA7670	Statistical Machine Learning
Elective-III	
DA8630	Computer Vision
DA8650	Software Testing
DA8670	Machine Learning & Neural Networks

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List of Open Electives (To be conducted in VIII Semester)

Sl. No.	Branch	Subject Code	Name of Elective subjects
1	Physics	OA8710 OA8720	1. Nano Scale Science and Technology 2. Photonics Technology
2	EE	EA8710 EA8720	1. Non-Conventional Energy Resources 2. Instrumentation and Process control
3	ME	LA8710 LA8720	1. Entrepreneurship development 2. Quality Management
4	Civil	CA8710 CA8720	1. Environment and Ecology 2. GIS
5	CSE	**DA8740** DA8710	1. Management Information System (MIS) 2. Business Intelligence
6	IT	IA8730 IA8721	1. Internet of Things 2. IT In Business
7	ECE	FA8710	1. Consumer Electronics
8	Humanities	HA8710 HA8720	1. Industrial Psychology 2. Human Values and Ethics
9	MBA	GA8710 GA8730 GA8740	1. Organizational Behavior 2. Digital Marketing 3. Financial Modeling with Spread sheet

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Course Title: **Engineering Mathematics-I**	Course Code: **JA1010**
Credit: **3.5**	L: **3** T: **1** P: **0**
Year: **1st**	Semester: **I**

UNIT I: Differential Calculus-I [**9**]

Functions of single variable: Limit continuity and differentiability; Indeterminate forms; Mean value theorems; Role's Theorem; Taylor's theorem with remainders; Curve tracing.

UNIT II: Differential Calculus-II [**9**]

Successive differentiation; Leibnitz theorem; Partial differentiation; Euler's theorem; Expansion of functions of several variables; Extrema of functions of several variables; Lagrange's method of multipliers.

UNIT III: Integral Calculus [**9**]

Improper integral-Beta and Gamma functions; Double and Triple integrals; change of order of integration; change of variables; Dirichlet's integral and its applications; Application of multiple integral.

UNIT IV: Vector Calculus [**12**]

Vector Differentiation: Scalar and vector fields; gradient of scalar point function; directional derivatives; divergence and curl of vector point function; solenoidal and irrotational vectors.

Vector Integration: line, surface and volume integrals; Green's theorem; Stokes' theorem and Gauss divergence theorem (without proof).

Text Books:

- R. K. Jain & S. R. K. Iyenger, **Advanced Engineering Mathematics**, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.

Reference Books:

- E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, John &Wiley Sons, U.K., 2006.
- B. S. Grewal, **Higher Engineering Mathematics**, 42th Edition, Khanna publication, New Delhi, India, 2012.

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Course Title: **Engineering Physics**	Course Code: **OA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **I**

UNIT I:

Relativistic Mechanics: Inertial and Non-inertial Frames; Postulates of Special Theory of Relativity; Galilean and Lorentz Transformation; Length Contraction and Time Dilation; Addition of Velocities; Variation of Mass with Velocity and Mass Energy Equivalence.

UNIT II:

Interference: Introduction; Coherent Sources; Analytical treatment of interference; Young's double slit experiment and its analysis; Conditions of Interference; Fresnel's Biprism; fringes with white light; Determination of wavelength of monochromatic light by using Fresnel's Biprism method; Displacement of Fringes; Interference in plane parallel thin film (reflected and transmitted light) and wedge shaped film(reflected light only); Newton's Rings; Determination of wavelength of monochromatic light and determination of refractive index of a liquid by using Newton's ring method.

UNIT III:

Diffraction: Introduction; Difference between Interference and diffraction; resultant of superposition of n simple harmonic coherent vibrations; Fraunhofer diffraction due to single slit: resultant intensity; conditions of maxima; minima; angular and linear width of central maximum; Double slit diffraction: resultant intensity; missing order; N-slit diffraction : resultant intensity; conditions of maxima and minima; missing orders; angular width of principal maxima; Diffraction grating: formation of spectra and missing order spectra in spectrum; dispersive power of grating; Resolving power; Rayleigh Criterion of resolution; Resolving power of plane transmission diffraction grating.

UNIT IV:

Polarization: Polarised and unpolarised light and its pictorial representation; plane of polarisation and plane of vibration; Phenomenon of Double Refraction; positive and negative double refracting crystals; properties of ordinary and extra-ordinary Rays; Nicol Prism and its application as a polariser and analyser; Mathematical analysis of superposition of two linearly polarised light vectors; retardation plates – half wave plate and quarter wave plate; Production and detection of Plane; Circularly and Elliptically Polarized Light.

Laser: Spontaneous emission; stimulated emission and stimulated absorption; Einstein's A and B Coefficients and relation between them; Principle of Laser Action; Construction and Working of He-Ne; Semiconductor Laser.

UNIT V:

Wave Mechanics : Wave Particle Duality; de Broglie Concept of Matter Waves; Davisson and Germer experiment; Concept of wave packet; group and phase velocity; Heisenberg Uncertainty Principle and its applications viz. non existence of electron in nucleus; radius and energy of Bohr's first orbit; Schrödinger time independent and time dependent wave equation; Physical interpretation of wave function; Application of Schrodinger wave equation: Particle in a one dimensional box (eigen function and eigen values).

Introduction to Fibre Optics: Fundamental ideas about optical fiber; Types of fibers; Acceptance angle and cone; Numerical Aperture.

Text Books:

1. AjoyGhatak**; Optics;** Tata Mc-Graw Hill Education;2009.
2. Subramanyam; BrijLal;**A Text Book of Optics**; S. Chand, 2004.
3. K. Thyagarajan, AjoyGhatak; **Lasers: Fundamentals and Applications**; Second;Springer, 2010.
4. AjoyGhatak& K. Thyagarajan ;**Introduction to Fiber optics;**Cambridge University Press,1998.
5. Halliday, Resnick& Walker; **Principles of Physics**; Nineth, Wiley, India;2013

Reference Books:

1. Arthur Beiser ;**Concepts of Modern Physics**; Tata Mc-Graw Hill Education;2003.
2. Robert Resnick;**Introduction to Special theory of Relativity** ; First; John Wiley& Sons; 1968.
3. Jenkins and White ;**Fundamentals of Optics**; Fourth; McGraw-Hill;2001
4. David. J. Griffith; **An Introduction to Quantum Mechanics**;Second; Pearson prentice Hall; 2004.
5. Young and Freedman;**Sears and Zemansky's University Physics**,Tenth; Addison-Wesley, 2000.

List of Experiments

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help ofFresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locatethe position of cardinal points.
4. To determine the specific rotation of cane sugar solution using bi quartz polarimeter.
5. To determine the wavelength of spectral lines using plane transmissiongrating.
6. To determine the specific resistance of the material of given wire usingCarey Foster's bridge.
7. To determine the variation of magnetic field along the axis of a currentcarrying coil and then to estimate the radius of the coil.
8. To verify Stefan's Law by electrical method.
9. To calibrate the given ammeter using potentiometer.
10. To calibrate the give voltmeter using potentiometer.
11. To determine energy band gap of a given semiconductor material by p-n junction method.
12. To determine the viscosity of water by Poisseuille's method.

Note: Additional experiments may be added based on contents of syllabus.

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Course Title: **Essentials of Mechanical Engineering**			Course Code: **LA1210**
Credit: **4.5**	L	T	P
	3	**1**	**2**
Year: **1st**			Semester: **I**

UNIT – I **9L**

Introduction to Engineering: Difference between Science and Technology, history of wheel, introduction to prime movers, transmission system, belt, pulleys, gear system and nomenclature, braking system, Mechanism, lever mechanism, Working principle of power generation system, hydel power plant, thermal power plant and its main components.

Coplanar Force system: Resolution of force in two mutually perpendicular direction Free Body Diagram, Moment, Varignon's theorem, static equilibrium, Lami'sTheorem, type of joints/Support, Type of load: point load, uniformly constant and varying loads, beam and its type.

UNIT – 2 **7L**

Engineering material and their properties: Details of hook's law, Proportional limit, Yield point, Yield Stress, Engineering strain, Engineering stress, True stress and Strain, Plasticity, Elasticity, Allowable Strength, Hardness, Ductility, toughness, Fatigue, creep, strain energy, Impact Strength, Young modulus of Elasticity, Bulk Modulus, Poission Ration and its relation in between.

Stress and strain: Normal stress and strain, principle of Superposition, Deformation in stepped and composite bar.

UNIT – 3 **7L**

Thermodynamics: Macroscopic & microscopic study point of view, System, Surrounding and Universe, Phase, Property, State, Path, Process, Cyclic and non-cyclic processes, Quasi static process, Reversible and irreversible processes , Thermodynamic equilibrium, Concept of continuum, Energy and its forms, Enthalpy, Zeroth law, Different temperature scales and theory of temperature and Pressure measurement.

UNIT – 4 **8L**

Laws of Thermodynamics: Thermodynamic definition of work, Thermodynamic processes, Calculation of work in various processes and sign convention, Non-flow work and flow work, Joules' experiment, First law of thermodynamics, Internal energy and enthalpy, First law of thermodynamics applied to open systems, Steady flow energy equation and its applications, First law analysis for closed system (non flow processes), Limitations of first law of thermodynamics, PMM-I.

Statement of Second Law of Thermodynamics: Kelvin Planck's statement and Clausius statement and their equivalence.

UNIT – 5 **9L**

Power generation: Air standard cycle**,** IC Engine**,** Carnot cycle, Otto cycle, Diesel cycle, Important components of I.C.Engine, two stroke and four stoke engine, S.I. and C.I. engines, efficiency of Otto and diesel cycle

Basics of Heat Transfer: Concepts of the mechanisms of heat flows: conduction, convection and Radiation heat transfer application in engineering.

Reference Books:

1. Basu,A.R; A Text book of Engineering Mechanics(Applied Mechanics);2003 Edition; Dhanpat Rai & co.(p) Ltd, Delhi.
2. Chandramouli, P.N; Engineering Mechanics; Second Printing; PHI Learning Private Limited, Delhi; 2013.
3. Rajput, R. K; Material Science; S. K. Kataria & Sons, New Delhi.
4. Dubey, N. H; Engineering Mechanics, Statics and Dynamics; First reprint; McGraw Hill Education (India) Private Limited, New Delhi, 2013.
5. Ratan, S.S; Theory of machines; Second Edition; Tata McGraw Hill Publishing Company Limited, New Delhi.
6. Nag.P.K.; Engineering Thermodynamics; 3rd Edition; Tata McGraw Hill Publishing Company Limited, New Delhi.
7. Nag.P.K.; Heat and Mass Transfer; Tata McGraw Hill Publishing Company Limited, New Delhi.
8. Kumar.D.S; Basic of Mechanical Engineering; S. K. Kataria & Sons, New Delhi.

Essentials of Mechanical Engineering Lab

List of Experiments

1. Tensile test
2. Impact test
3. Hardness test
4. Pulley experiment
5. Experiment on conduction heat transfer
6. Demonstration of Impulse and reaction turbine
7. Study of 4s and 2S engine petrol Engine
8. Study of 4s and 2S engine Diesel Engine
9. Study of refrigerator and air conditioning

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Course Title: **Professional Communication – I**	Course Code: **HA1210**
Credit: **3.5**	L T P **3 1 0**
Year: **1st**	Semester: **I**

UNIT 1: **COMMUNICATION** **(6 Hrs)**

1. Communication: Definition and Process of Communication.
2. Types of Communication: Formal and Informal Communication, Verbal and Non-Verbal Communication.
3. Barriers to Communication: Intrapersonal and Interpersonal Barriers. Semantic Barriers, Physical Barriers, Psychological Barriers, and Organizational Barriers.

UNIT 2: **LISTENING SKILLS & SPEAKING SKILLS** **(8 Hrs)**

1. Importance and Objective of Listening Skills, Process of Listening, Listening and Hearing, Types of Listening, and Methods for Improving Listening Skills
2. Listening Comprehension: Identifying General and Specific Information.
3. Listening for Note taking and drawing Inferences.
4. Importance of Speaking Skills, Types of Speaking, Methods for Improving Speaking Skills
5. Introduction to Phonetic Transcription: Familiarization with British and American Usage.

UNIT 3: **READING SKILLS** **(4 Hrs)**

1. Importance of Reading Skills, Types of Reading Skills, Methods of Improving Reading Skills.
2. Vocabulary Building: Antonyms, Synonyms, Homophones, Homonyms, and One-Word Substitution, Etymology and roots.

UNIT 4: **WRITING SKILLS** **(10 Hrs)**

1. Importance of Writing Skills, Types of Writing Skills, and Methods for Improving Writing Skills.
2. Sentence and Paragraph Construction. Writing Expository, Argumentative and Deductive Order etc Paragraphs.
3. Précis Writing
4. Basic Letter Writing: Format and Style of Formal Letters.

UNIT 5: **ONE ACT PLAY** **(6 Hrs)**

Practice of LRSW through the study of the one act play, ***THE REFUND*** by **Fritz Karinthy**.

TEXT BOOK

1. Gupta, Ruby. Basic Technical Communication, Cambridge University Press, New Delhi.2012.

REFERENCE BOOKS

1. Rizvi, Ashraf. Effective Technical Communication, McGraw Hill, New Delhi. 2005
2. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011
3. Tyagi, Kavita& Padma Misra. Basic Technical Communication, PHI, New Delhi. 2011
4. Lewis, Norman. Word Power Made Easy, W.R Goyal Pub. & Distributors.1995
5. Ford A, Ruther. Basic Communication Skills; Pearson Education, New Delhi.2013
6. Aslam, Mohammad. Introduction of English Phonetics and Phonology Cambridge.2003
7. Kameswari, Y. Successful Career Soft Skills and Business English, BS Publications, Hyderabad.2010
8. English Pronouncing Dictionary, Cambridge.2012
9. The Oxford Guide to Writing and Speaking. OUP, Delhi.2011

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Professional Communication – I Lab

Lab 1	Neutralization of Mother Tongue Influence through manner of articulation
Lab 2	Common Errors in English and Indianisms.
Lab 3	Introduction to Speech Sounds – Practicing Vowel and Consonant sounds
Lab 4	Syllable, word stress, Sentence stress
Lab 5	Pause group, Intonation & Rhythm
Lab 6	Functional English
Lab 7 & 8	Everyday Conversation : Greetings, Apologies, Requests, At a Restaurant, Shopping, Groceries, Hiring an Apartment, Travel Courses, etc.
Lab 9	Developing Listening skills through cultural movies
Lab 10 &11	Movie - To provide exposure to the target language
Lab 12	Final evaluation based on Extempore

References: (Software and Videos)

1. Wordsworth English Language laboratory software
2. Wordsworth Prep 1-2-3
3. Connected Speech Level 1-2-3
4. Learn To speak English CD 1-2-3-

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Course Name	**IBM CE - Software Foundation Course with C Programming**
Course Code	RATSWF3BIN / **DK1210**
About Technology	Software is the invisible thread that exists today in all systems that we see or experience, be it while travelling, shopping, banking, connecting with friends or performing any other routine task. Software not only integrates information, empowers people, connects global ecosystems, and optimizes business processes but, also brings business, people, and the world together. The open source technologies and concepts form the conceptual foundation of current day software development platforms.
About Course	This course provides conceptual and foundational knowledge of the Fundamentals of technologies in the context of software and programming. The contents of this course will ensure a student's interest in the subject is well founded and sows a seed for a conceptual understanding of History of Computing, including programming and the Open Source concepts. The course includes enough hands on exercises for the students to be glued on to it.
Target Audience	The Software Foundation course enables students in early stages of undergraduate studies who want to make a career in Information Technology industry. Students of: – CS/IT/ECE/EEE Engineering - 1st / 2nd Year – BCA/ BSC – 1st / 2nd year
Pre-requisites	No previous Software knowledge, other than basic computer/Windows usage required.
Contents	Brief History of Computing Art and Science of Programming Introduction to C Programming - Background of C - Getting Started with C - Constructs, Loops & Arrays - Functions - Pointers - User Defined Types - Binary I/O With Structures - Appendix. Reference Tables Open Standards, Open Source, and IBM - What is an Open Standard - Open Standards Model - Industries needing standards - The Impact of Standards - Open Source Software - Open Source - Open Source Technology - The OPEN Proposition Introduction to Linux - What is Linux - Background of Linux - Why is Linux so popular - What can you do with Linux - Linux Distributions - Linux Technology Center - Future of Linux PHP - What is PHP - PHP – Key Driver of LAMP Stack

- Getting Started with PHP
- Unified ODBC
- PHP Data Objects
- PHP Deployment Platform
- What is Zend Core
- Features and Benefits
- Zend and IBM
- What is Ruby
- What is Rails

Applicable Prometric Certification - NA -

Follow on courses

- IBM CE - Software Foundation (Advanced) Course with C++ Programming
- IBM CE Minor Projects
- IBM CE – Introduction to Object -Oriented Programming using Java
- IBM CE - Basics of Information Management with DB2
- IBM CE - Basics of IBM Rational Rhapsody
- IBM CE - Introduction to Cloud Computing

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Course Title: **Environmental Science**	Course Code: **BA1010**
Credit: **2**	L **2** T **0** P **0**
Year: **1st**	Semester: **I**

Unit – 1 **(6L)**

Natural Resources: Renewable and non-renewable resources

Definition, scope, importance and need for public awareness, natural resources and associated problems.

- Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
- Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
- Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture and green revolution, water logging, salinity.
- Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources.
- Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Unit – 2 **(5L)**

Ecosystems

Concept, Structure and function of an ecosystem, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the Forest and aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit – 3 **(5L)**

Biodiversity and its conservation

Introduction – Definition: genetic, species and ecosystem diversity. Bio geographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-sports of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit – 4 **(6L)**

Environmental Pollution

Definition, Cause, effects and control measures of:-

a. Air pollution b. Water pollution c. Soil pollution
d. Marine pollution e. Noise pollution f. Thermal pollution
g. Nuclear hazards

• Solid waste Management and biomedical waste: Causes, effects and control
• Role of an individual in prevention of pollution.
• Pollution effects-global warming, acid rain, ozone depletion, smog and case studies.
• Disaster management: floods, earthquake, cyclone and landslides.

Unit – 5 **(6L)**

Social Issues and the Environment

• From Unsustainable to Sustainable development
• Water conservation, rain water harvesting, watershed management
• Environmental Impact Assessment and Resettlement and rehabilitation problems.
• Climate change
• Wetland conservation.
• Role of remote sensing and GIS in environmental monitoring and analysis
• Environment Protection Act. 1986
• Air (Prevention and Control of Pollution) Act. 1981
• Water (Prevention and control of Pollution) Act 1974
• Wildlife Protection Act 1972
• Forest Conservation Act 1980.

Field work:

• Visit to a local area to document environmental assets river/forest/grassland/hill/mountain
• Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
• Study of common plants, insects, birds.
• Study of simple ecosystems-pond, river, hill slopes, etc.

REFERENCE BOOKS:

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad –380 013, India, Email:mapin@icenet.net (R)
2. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
3. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
4. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
5. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
6. Gleick, H.P. 1993. Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
7. Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
8. Mckinney, M.L. & School, R.M. 1996. Environmental Science Systems & Solutions, Web enhanced edition. 639p.
9. AnubhaKaushik&Kaushik, C.P. 2009.Perspectives in Environmental Studies, New Age International Publishers.
10. Manahan. S.E., Environmental chemistry, 9th edition.

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Course Title: **Engineering Graphics**	Course Code: **LA1220**
Credit: 1	L: **1** T: **0** P: **0**
Year: **1st**	Semester: **I**

UNIT – 1
Introduction: Sheet Layout, Types of Sheet, Size of Sheets, Title blocks, Type of lines, Lettering, Dimensioning, Scale (Full, Reduced, Large) Geometrical Constructions,
UNIT – 2
Projection: Methods of Projection, Planes of Projection, Projection of points, Projection of straight lines, Projection of auxiliary planes, Projection of planes.
UNIT – 3
Projection of solids, Sections of solids.
UNIT – 4
Development of surfaces
UNIT – 5
Isometric Projections

Reference Books:
1) Bhatt N. D. & Panchal V. M, "Engineering Drawing", Charotar Publisher, 2007.
2) Dhanjay A Jolhe, "Engineering Drawing" Tata McGraw Hill, 2008.
3) Gill P.S "Engineering Graphics" S. K. Kataria & Sons, 2009
4) John K.C, "Engineering Graphics" , 2nd edition, PHI Learning Pvt. Ltd., 2010

List of Experiments

1. Introduction to AutoCAD Commands, Explaining need of AUTO CAD over Manual drafting, Simple Drawings.
2. Sheet on Lettering and Geometric construction.
3. Orthographic Projections, Basic problem based on Projection of points.
4. Sheet on Projection of Lines.
5. Sheet on Projection of Planes.
6. Sheet on Projection of Auxiliary Planes.
7. Sheet on Projection of Solids.
8. Development of Surfaces.
9. Sheet on Isometric Projections from orthogonal views.

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Course Title: **Engineering Mathematics – II**	Course Code: **JA2010**
Credit: **3.5**	L **3** T **1** P **0**
Year: **1st**	Semester: **II**

UNIT I: **(10L)**

Linear Algebra

Matrices; Inverse of matrix; Echelon form; Rank of matrix; Consistency and solution of a system of linear equations; Linear dependence and independence of vectors; Matrix transformations; Eigen values and eigenvectors; Cayley– Hamilton theorem; Reduction to diagonal form; Vector spaces; Sub spaces; Basis; Dimension; Linear Transformation**.**

UNIT II: **(8L)**

Differential Equations

Linear differential equations first order and first degree; Linear differential Equations of higher orders with constant coefficients; Complementary functions and Particular integrals; Euler-Cauchy linear differential equations; Simultaneous linear differential equations; Method of variation of parameters.

UNIT III: **(6L)**

Infinite Series

Introduction; Sequences; Series; Convergence; Series of positive terms; Comparison test; Integral test; D'Alembert's Ratio test; Cauchy's root test; Alternating series; Leibnitz rule.

UNIT IV: **(8L)**

Fourier Series

Periodic functions; Fourier series of Periodic functions; Euler's formulae; Functions having arbitrary period; Change of intervals; Even and Odd functions; Half range sine and cosine series.

UNIT V: **(8L)**

Laplace Transform

Laplace Transform; Existence theorem; Properties of Laplace Transform ; Laplace Transform of derivatives and integrals; Laplace Transform of Periodic functions; Unit Step function and Error Function; Dirac- Delta function; Unit impulse function; Convolution theorem; Applications of Laplace Transform to solve linear and simultaneous differential equations.

Text Books:

1. R. K. Jain & S. R. K. Iyenger, **Advanced Engineering Mathematics**, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.
2. E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, John Wiley & Sons, U.K., 2006.

Reference Books:

1. W. E. Boyce and R. Di Prima, **Elementary Differential Equations**, (8th Edition), John Wiley & Sons, U.K., (2005).
2. B. S. Grewal, **Higher Engineering Mathematics**, 42nd Edition, Khanna Publication, New Delhi, India, 2012.

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Course Title: **Engineering Chemistry**			Course Code: **BA1210**
Credit: **4.5**	L **3**	T **1**	P **2**
Year: **1st**			Semester: **II**

UNIT – I

Water Chemistry

Introduction, Analysis of Water – Alkalinity, Chlorides and Dissolved Oxygen, Hardness of Water - Temporary and Permanent hardness, Estimation of hardness by EDTA Method, Disadvantages of Hard Water, Numerical problems.

Water for Industrial purpose – Boiler Feed Water, Boiler Troubles (Priming and Foaming, Boiler Corrosion, Scales and Sludges, Caustic Embrittlement), Water Treatment: Internal Treatment (Colloidal, Phosphate, Calgon, Carbonate Conditioning), External Treatment (Lime-Soda Process, Zeolite Process, Ion- Exchange Process), Numerical Problems.

UNIT – II

Physical Chemistry

Electrochemistry: Reference electrodes, Ion selective electrodes, Chemically modified electrodes as sensors, Electrochemical energy systems, Lithium batteries, Fuel cells.

Thermochemistry: Hess's Law, Heat of a reaction, Effect of temperature on heat of reaction at constant pressure (Kirchoff's eq.), Heat of dilution, Heat of hydration, Heat of neutralization and Heat of combustion.

Surface chemistry: Surface and interfacial tension, Capillary pressure.Adsorption phenonmenon, Adsorption of gaseson solids, Frendlich and Langmuir adsorption isotherms,Role of adsorbents in catalysis, ion-exchange and pollution abatement.

UNIT – III

Science of Corrosion and Protective Coatings

Introduction, Types of Corrosion, Theories of Corrosion and Mechanism, Factors Influencing Corrosion.Control of Corrosion.

Types of Protective Coatings: Metallic Coatings, Anodic Coatings, Galvanization, Cathodic Coatings, Tinning, Metal Cladding, Electroplating (Chromium Plating, Metal Spraying, Cementation-Sheradizing, Colourizing, Chromizing).

UNIT – IV

Introduction to Polymers and Nano-materials

Polymerization, Classification of polymers, Addition and Condensation Polymerizations. Plastics - Thermosetting and Thermoplastics. Preparation, Properties and Uses of Polyethylene, PVC, Teflon, Bakelite, Nylon, Polyester, Polyurethane, Ziegler-Natta catalyst, conducting polymers.Rubber- Processing of Natural Rubber, Vulcanization and Compounding. Elastomers: Buna-S, Buna- N, Thiokol.

Introduction to Nano-materials: Fullerenes, Nano-tubes, Nano-wires, Nano-cones, Nano-dots, Nano-sphere, Haeckelites. Their electronic and mechanical properties, Production methods for CNTs. Applications of nano materials in i) Medicine ii) Catalysis iii) Environmental Technologies iv) Electronics& related fields. v) Mechanics.

UNIT – V

Fuels & Lubricants

Fuels: Classification, crude oil: composition and fractionation, Octane & Cetane Number and their significance; calorific value of fuel, Determination of calorific value of fuels, bomb calorimeter, Solid fuels - Proximate and ultimate analysis, Numericals problems.

Lubricants: Functions of lubricants, Mechanism of Lubrication (thick film or hydrodynamic lubrication, thin film or boundary lubrication, extreme pressure lubrication), Classification and properties of lubricants-

Viscosity, Flash and fire point, Cloud and pour point, Aniline point, Neutralization number and mechanical strength. Numerical problems on acid value and saponification value.

Text Books:

1. Chemistry in Engineering & Technology (Vol I & II) (Latest ed.) By J.C. Kuriacose& J. Rajaraman, Tata McGraw-Hill Co, New Delhi.
2. Engineering Chemistry by O.G. Palanna, Tata McGraw-Hill Co, New Delhi.

Reference Books:

1. Atkins' Physical Chemistry by Peter W. Atkins and Julio de Paula, Oxford University Press.
2. Principles of Physical Chemistry (Latest ed.) By Puri, Sharma & Pathania.
3. Organic chemistry, Morrison and Boyd, Pearson Prentice Hall, 2011
4. Environmental chemistry, S.E. Manahan, 9th edition, CRC Press.
5. Textbook of polymer science by F.W. Billmeyer, Wiley India.

Engineering Chemistry Lab

List of Experiments

1. Estimation of hardness of water by EDTA method
2. Estimation of total alkalinity in the given water sample.
3. Estimation of dissolved oxygen in the given water sample.
4. Estimation of available chlorine in the given sample of bleaching powder.
5. pH-metric titration.
6. Determination of viscosity of lubricants by Redwood viscometer / Ostwald's viscometer.
7. Determination Surface Tension of lubricants.
8. Determination of Flash point of a given oil by Pensky_Marten's flash point approach.
9. To Determine Saponification-value of the given Lubricating Oil.
10. To Determine Acid-Value of the given Lubricating Oil.
11. To determine the moisture, volatile and ash contents in a given coal sample by proximate analysis.
12. To study the adsorption of acetic acid on activated charcoal.

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Course Title: **Introduction to Electrical Engineering**	Course Code: **EA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **II**

UNIT – 1
D.C. NETWORK THEORY
Review of basic circuit theory concepts, Mesh and Nodal analysis, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Star–delta transformation, Magnetic Circuits.

UNIT – 2
A.C. CIRCUITS & MEASURING INSTRUMENTS
*Single Phase A.C.:*Phasor representation of voltage and current, A.C. circuit behavior of resistance, inductance, capacitance & their combination in series and parallel, Power triangle, Power factor, Concept of series & parallel resonance.
*Three Phase A.C.:*Star – delta connections, Relation between line and phase quantities, three phase power and its measurement, What is 3 phase 4 wire and 3 phase 5 wire system?
Measuring Instruments: Construction and principle of voltage and current measuring instruments.

UNIT – 3
TRANSFORMERS
Principle of operation, Types of construction, Phasor diagram, Equivalent circuit, Efficiency and voltage regulation of single phase transformer, O.C. and S.C. tests.

UNIT – 4
D.C. & SYNCHRONOUS MACHINES
D.C. Machines: Construction and working principle of d.c. generator and d.c. motor, Types of d.c. machines, E.M.F. equation, Torque equation, Magnetization and load characteristics, Losses and efficiency, Need of starter in d.c. motors.
Synchronous Machines: Construction and Principle of operation of Alternator and Synchronous Motor.

UNIT – 5
INDUCTION MOTORS
Three Phase Induction Motors: Principle of operation of 3-Ø induction motor, Types of 3-Ø induction motor, Need of starters in 3-Ø induction motors, Slip – torque characteristics,
Single Phase Induction Motor: Principle of operation of single phase induction motor, Methods of starting of single phase induction motor.

Reference Books:
1. V. Del Toro. " Principles of electrical Engineering, "Prentice hall International.
2. W.H. Hayt& J.E. Kemmerly," Engineering circuit Analysis, "McGraw Hill.
3. I. J. Nagrath, "Basic Electrical Engineering," Tata Mc. Graw Hill.
4. A. E. Fitgerald, D.E., Higginbotham and A Grabel, "Basic Electrical Engineering" McGraw Hill
5. H. Cotton, "Advanced Electrical Technology" Wheeler Publishing.

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Basic Electrical Engineering Lab

(Any Ten)

1. Verification of Network Theorems.
2. Study of diode characteristics. Study of phenomenon of resonance in RLC series circuit.
3. Measurement of power in a three phase circuit by two wattmeter method.
4. Measurement of efficiency of a single phase transformer by load test.
5. Determination of parameters and losses in a single phase transformer by OC and SC test.
6. Study of characteristic of DC Motor.
7. Study of characteristic of AC Motor.
8. DC generator characteristics.
9. 10. Speed control of dc shunt motor.
10. Study running and reversing of a three phase induction motor.
11. Study of a single phase energy meter.

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Course Title: **Introduction to Electronics & Communication**			Course Code: **FA1210**
Credit: **4.5**	L **3**	T **1**	P **2**
Year: **1st**			Semester: **II**

UNIT 1: Fundamental of Semiconductors ***10 L***

Energy bands in semiconductors, intrinsic and extrinsic semiconductors, Fermi Level in Intrinsic and Extrinsic semiconductor, Carrier transport in semiconductors: diffusion current, drift current, mobility, Hall Effect and resistivity. Generation and recombination of carriers.

UNIT 2: Application of Low Power and High Power Diodes ***10 L***

Diode circuits: Construction, Junction diode characteristics, Half and full wave rectifiers - Expression for efficiency and ripple factor - Bridge rectifier – π Filter circuits, Clipper, Clamper and multipliers using diodes, Zener Diode Characteristics - Regulated power supply using Zener diode.

UNIT 3: Transistor fundamentals ***8 L***

Transistor circuits: Characteristics of a transistor in CB, CE and CC modes - Relatively merits - Biasing of Transistors - Load Line and operating point concept (both AC and DC). Construction and working of JFET and MOSFET.

UNIT 4: Digital fundamentals and Introduction to Signals ***8 L***

Basic logic gates: AND, OR, and NOT – implementation of all gates using Universal gates, Number Systems conversions, Boolean algebra, K-map (upto 4 variables). Source of Information, Types of Signals.

UNIT 5: Basics of Communications & Instrumentation ***9 L***

*C*ommunication Systems, Communication Channels, Need of modulation, Types of modulations (Wave shapes and final expression only), Study of Piezoelectric, PMMC, LVDT and Strain Gauge transducers and their classifications and display device (7 segment) only.

Reference Books:

Unit 1. Electronics Devices and Circuits, Millman and Halkias, Tata McGraw Hill, 4th ed.
Unit 2 & 3. Electronic Devices and Circuit Theory, Robert L. Boylestad, Prentice Hall Higher Edu., 2000.
Unit 4. Digital Design, Morris Mano, PHI
Unit 4. Modern Digital & Analog Communications, B. P. Lathi, OUP
Unit 5. Electronic Communication Systems, John Kennedy , Tata McGraw Hill, 4th ed.
Unit 5. Electronic Instrumentation - H. S. Kalsi

ELECTRONICS ENGINEERING LAB.

1. To identify and Study of the various component and Devices of electronics with their specification (CRO, Function Generator, Multimeter, Power Supply, resistor, capacitor, inductor, ICs, LED, potentiometer etc.)
2. To study the V-I characteristics of PN diode and Zener diode.
3. To find the efficiency of Rectifiers and ripple factor of capacitive and non-capacitive half wave and full wave rectifier.
4. To Study and Verify clipper and clamper with biased circuits.
5. To find the characteristics of CB and CE amplifiers.
6. Determine the characteristics of FET.
7. To find out the power energy of various periodic and non periodic signals.
8. To verify the logic gates using diodes.
9. Study and observations of AM & FM Waveforms.
10. Study of various transducers (Strain Gauge).

***** *Plus 2-3 value added experiments can be performed.*

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Course Title: **Professional Communication – II**			Course Code: **HA2210**
Credit: **3.5**	L **3**	T **0**	P **1**
Year: **1st**			Semester: **II**

UNIT 1: **PROFESSIONAL COMMUNICATION** **(6 Hrs)**

1. Importance and Features of Business Communication, Flow and Channels of Communication in an Organization.
2. Introduction to Technical Communication, Types and History of Technical Communication.
3. Difference between General and Technical Communication, and Importance of Technical Communication.
4. Characteristic of Technical Communication, and Elements of Style.
5. Process of Preparing a Technical Document.
6. Elements and Features of Scientific Articles.
7. Compunication, E- mail, E- tools and Encyclopedia.

UNIT 2: **BUSINESS CORRESPONDENCE** **(8 Hrs)**

1. Business Correspondence – Principles, Features, Types, Format and Layout of Business Letter.
2. Inter Office Correspondence – Letters of Enquiry, Quotation, Order, Sales, and Complaint.
3. Intra Office Correspondence: Notice, Agenda, Minutes, and Memorandum.
4. Job Application Letter.

UNIT 3: **TECHNICAL PROPOSAL and TECHNICAL REPORT** **(8 Hrs)**

1. Technical Proposal - Introduction, Purpose, Features, Types, Format, Importance, and Writing Technical Proposals and Plagiarism.
2. Technical Report - Features, Types, Style, Format, Relevance, and Writing Technical Reports.

UNIT 4: CORPORATE COMMUNICATION SKILLS **(8 Hrs)**

1. Dimensions and importance of EQ
2. Interpersonal communication skills - Life Position, and Transactional Analysis
3. Johari Window: Role of Feedback and Disclosure in Communication; Accepting Criticism
4. Cross Cultural Communication
5. Attitude
6. Perception
7. Personality Attributes and Communication: Self Esteem, Self-Monitoring, Impression Management, and Locus of Control.
8. Conflict and Negotiation

UNIT 5: PROJECT **(6 Hrs)**

REPORT WRITING/ PROPOSAL WRITING

The students will write a Report **OR** a Proposal consisting of 10-15 pages.

REPORT WRITING

1. **For B.Tech. students**-
    a. Technical Report describing new machinery, a report on the sudden break down in production unit, and market survey report for formulating new market strategy.
2. **For B.Pharma. students**
    a. Technical Report based on the site inspection of a drug manufacturing unit, Survey Report on Health Awareness and Self-Medication.
3. **For B.Arch. students**

a. Technical Reports based on a Site Inspection for Geographical and Geological aspects of a particular location, A Report on the Architectural Survey of a Monument. Architectural

PROPOSAL WRITING

1. **For B.Tech. students**
   a. Technical Proposal to organize a Technical Training Program, To develop new range of a product and to start a new venture.
2. **For B.Pharma. students**
   a. Technical proposal to establish a new laboratory, To create new drug-composition and to visit to a Super Specialty Hospital.
3. **For B.Arch. students**
   a. Technical Proposal for an Archeological Site visit , To Construct New Buildings.

Report Writing and Proposal Writing carries 30 marks equivalent to three class tests.

TEXT BOOK

1. Gupta, Ruby. Advanced Technical Communication, Cambridge University Press, New Delhi. 2011.

SUGGESTED REFERENCE BOOKS

1. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011.
2. Tyagi, Kavita& Padma Misra. Advance Technical Communication, PHI, New Delhi.2011
3. Technical Communication, Cengage Learning, New Delhi.2010
4. Technical Communication, OUP, New Delhi. 2013
5. Wallace, Masters Personality Development, Cengage Learning, New Delhi.2006
6. Barrass, Robert: Students Must Write, Foundation books, Cambridge, New Delhi.2006
7. Rao, Bhaskar: Successful Career Soft Skills and Business English, BS Publications, Hyderabad.2012
8. Chakrawarthi: Soft Skills for Professionals, Wiley India.2011

Professional Communication – II Lab

Lab 1	Vocabulary Building
Lab 2	Telephone Etiquette: Making an appointment , answering Calls
Lab 3	Public Speaking
Lab 4	Group Discussion: Do's and Don'ts of GD
Lab 5 & 6	Interview Skills: Preparation
Lab 7	PP Presentation Skills: Techniques of making effective presentation
Lab 8	Meeting : Conducting meetings effectively
Lab 9	Developing Negotiating skills
Lab 10 &11	Reading Comprehension
Lab 12	Evaluation

References: (Software and Videos)

1. Wordsworth English Language laboratory software
2. Wordsworth Prep 1-2-3
3. Communicate
4. Train 2 Success
5. Additional PPTs

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Course Name **IBM CE - Software Foundation (Advanced) Course with C ++Programming**

Course Code RATSWF4BIN **/ DK 2210**

About Technology Software is the invisible thread that exists today in all systems that we see or experience, be it while travelling, shopping, banking, connecting with friends or performing any other routine task. Software not only integrates information, empowers people, connects global ecosystems, and optimizes business processes but, also brings business, people, and the world together.
The technologies and concepts like XML, Information Management and Java form the conceptual foundation of current day software development platforms.

About Course This course provides conceptual and practical knowledge of the Fundamentals of technologies in the context of building enterprise web based applications.
The contents of this course will ensure that a student interest in the subject is well founded and sows a seed for a conceptual understanding of software and computing practices of current generation.

Target Audience The Software Foundation course enables students in early stages of undergraduate studies who want to make a career in Information Technology industry.
Students of:
- CS/IT/ECE/EEE Engineering - 1st / 2nd Year
- BCA/ BSC – 1st / 2nd year

Pre-requisites No previous Software knowledge, other than basic computer/Windows usage required. Basic web Programming/HTML and basic database conceptual knowledge is desired.

Contents

1. Introduction to C++
- OOPS
- Essentials of Programming
- Features of C++
- Inheritance, Polymorphism & Encapsulation
  Operator Overloading
- I/O in C++
- Advanced Topics

2. Information Management
- Information as a Service
- IBM Information Management Software
- Order Fulfillment System – Example Case
- Open Source: Derby
- Cloudscape
- DB2 9 pureXML Technology
- DB2 Express-C
- DB2 Data Server Editions
- Information Integration Business Drivers

3. Introduction to XML and Related Technologies
- Issues in information exchange
- What is XML?
- Exercise: XML basics
- Document type definitions (DTDs)
- Exercise: Working with DTDs
- XML namespaces
- Exercise: XML namespaces
- XML schema, part 1
- Exercise: Generating XML schemas
- XML schema, part 2
- Exercise: XML schemas

- XPath
- Exercise: XPath (and quiz)
- XSL transformation: part 1
- Exercise: XSLT part 1 - simple XSL transforms
- XSL transformation: part 2
- Exercise: XSLT part 2 - simple XSL transforms

4. Introduction to Integrated Development Environment – Eclipse

- What is Eclipse
- Eclipse Architecture
- Eclipse Platform Architecture
- Eclipse Plug-in Architecture
- Eclipse Case Studies
- Eclipse Terms and Concepts

5. Java Development Tools

- The JDT environment
- Creating and running a program
- Automating testing with JUnit
- Using Ant and javadoc

6. Debugging Applications

- Using the debugger:
- Starting the debugger
- Setting breakpoints
- Stepping through the code
- Inspecting variables and expressions
- Hot code replace

7. The Eclipse Architecture

- A brief discussion of the Eclipse plug-in architecture
- Finding, installing and updating plug-ins
- Some popular plug-ins

8. Eclipse Web Tools Platform Project 1.0

- Eclipse Web Tools Platform (WTP 1.0) Project
- Web Standard Tools
- J2EE Standard Tools
- The Data Tools Project
- The AJAX Tools Framework

9. Software in Real World:
   The IBM Canvas - some of the tools that students shall learn about and use in their future trainings and projects on the IBM technologies.
10. Software in Real World: The Road Ahead
    The Road Ahead is woven with the overall course content, especially the IBM Canvas to help students in selection of the right career path and the related IBM courses.

Applicable Prometric Certification - NA -

Follow on courses

- IBM CE Minor Projects
- IBM CE – Introduction to Object -Oriented Programming using Java
- IBM CE - Basics of Information Management with DB2
- IBM CE - Basics of IBM Rational Rhapsody
- IBM CE - Introduction to Cloud Computing

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Course Title: **Workshop Practice**			Course Code: **LA1110**
Credit: **1**	L **0**	T **0**	P **2**
Year: **1st**			Semester: **II**

List of Experiments

1. Carpentry: To make a T-Lap joint with soft wood.
2. Arc Welding: To make a Lap joint with mild steel flat by arc welding process.
3. Gas Welding: To make a Lap joint of M.S. sheet with gas welding process.
4. Fitting: To make a plug and socket joint with M.S. flat.
5. Machine Shop: To turn a M.S. rod on lathe to prepare a turning specimen.
6. Sheet Metal: To make a square tray with G.I. sheet.
7. Study of Foundry and Forging tools and equipments

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Course Title: **DATA STRUCTURES**			Course Code: **DA3210**
Credit: **4**	L **3**	T **0**	P **2**
Year: **2nd**			Semester: **III**

Unit I : **Introduction:** Concept of data structure, Types of data structures, Character String in C, Recursion, Structure, Pointer, Dynamic Allocation, Algorithms, Algorithm analysis, Complexity of algorithms and Time space trade-off.

Arrays: Introduction, Single and multi-Dimensional Arrays, address calculation, application of arrays, Operations defined: traversal, insertion and deletion.

Stacks: Stacks, Array representation of stack, Applications of stacks, Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack.

Unit II : **Queue:** Queue, Array representation and implementation of queues, Circular queues, Operations on Queue: Create Add, Delete, and Full and Empty, De-Queue, Priority queues, Applications of Queues.

Linked Lists: Concept of linked list, Representation and implementation of singly linked list, Circular linked list, doubly linked list, Operations on Linked lists, Concepts of header linked lists, applications of linked lists.

Unit III : **Trees:** Basic terminologies of trees, Binary tree, Complete Binary tree, Extended Binary tree, Representation of Binary tree, Binary tree traversal, Operations on Binary tree.

Binary Search Tree: Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, B-trees.

Unit IV : **Graphs:** Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Representations of Graphs, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.

Unit V : **Searching** & **Hashing:** linear search, binary search, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.

Sorting: Bubble sort, Insertion sort, Selection sort, Quick sort, Merge sort, Heap Sort.

File Handling: Introduction to file handling, Data and Information, File concepts, File organization, files and streams, working with files.

Text Book:

1. Lipschutz, "Data Structures" Schaum's Outline Series, TMH.
2. A. M. Tenenbaum, Langsam, Moshe J. Augentem, Data Structures using C PHI Pub.

Reference Book:

1. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication.
2. Robert Kruse, Data Structures and Program Design in C PHI.
3. Willam J. Collins, Data Structure and the Standard Template library –2003, T.M.H.

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Course Title: **COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES**			Course Code: **DA3220**
Credit: **4**	L **3**	T **0**	P **2**
Year: **2nd**			Semester: **III**

Unit I : **Introduction:** Numbers and their accuracy, Computer Arithmetic, Errors and their Computation, General error formula, Error in a series approximation.

Solution of Algebraic and Transcendental Equation: Bisection Method, Iteration method, Method of false position, Secant method, Newton-Raphson method, Rate of convergence of Iterative, Newton Raphsion methods.

Unit II : **Interpolation:** Finite Differences, Difference tables Polynomial Interpolation**:** Newton's forward and backward formula Central Difference Formulae: Gauss forward and backward formula, Stirling's, Bessel's, Everett's formula. Interpolation with unequal intervals: Langrange's Interpolation, Newton Divided difference Formula.

Unit III : **Statistical Computation:** Frequency chart, Curve fitting by method of least squares, fitting of straight lines, polynomials, exponential curves, Regression Analysis, Linear and Non linear Regression, Multiple regression.

Unit IV : **Numerical Integration and Differentiation:** Introduction, Numerical differentiation Numerical Integration: Trapezoidal rule, Simpson's 1/3 and 3/8 rule, Boole's rule.

Unit V: **Solution of differential Equations:** Picards Method, Eulers Method, Taylors Method, Runge-Kutta Methods, Automatic Error Monitoring and Stability of solution.

Text Book:

1. Pradip Niyogi, "Numerical Analysis and Algorithms", TMH, 1st Edition.
2. Gerald & Whealey, "Applied Numerical Analysis", AW

Reference Book:

1. Grewal B S, "Numerical methods in Engineering and Science", Khanna Publishers, Delhi.
2. Srimamta Pal Numerical Method Principles, analysis and algorithms, (Oxford Higher ed)
3. Rajaraman V, "Computer Oriented Numerical Methods", PHI, 3rd edition.

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Course Name	**IBM CE – Introduction to Object -Oriented Programming using Java**
Course Code	RPROOPJFN/ **DK 3210**
Course Duration	
About the Technology	Java technology is both a programming language and a platform. The *Java programming language* is a high-level, object-oriented language. Java programs are both *compiled* and *interpreted*. Compilation translates Java code into an intermediate language called Java *bytecode*. Bytecode is in turn parsed and run (interpreted) by the Java Virtual Machine (JVM) — a translator between the language and the underlying operating system and hardware. A compiled Java program can run on any system that has a version of the JVM. The *Java platform* is a software-only platform that can run on top of most hardware platforms. It consists of the JVM and the Java API — a large collection of ready-made components (*classes*) that ease application development and deployment. The Java API spans everything from basic objects, to networking and security, to XML generation and web services. It is grouped into libraries — known as *packages* — of related classes and interfaces.
About the course	The course begins with an introduction to the Java programming language and a review of the principles of object-oriented (OO) development before focusing on how to create object-oriented applications in Java. This course includes topics such as recognizing Java constructs that enable object-orientation. The course provides you with an overview of the Java language syntax, including packages, classes, methods, variables, conditional statements, and control flow. You then learn about the role of inheritance and interfaces in Java, how to create and handle exceptions, and how to refactor code. In addition, this course covers various new features of Java SE 5 and Java SE 6, such as generics, autoboxing, and annotations. You also learn about the different Java application programming interfaces (APIs), focusing on the APIs most commonly used in real-world Java applications such as Collections, Input/Output (I/O), Threads, and other utility classes.
Audience	This course is designed for people with little or no Java programming experience. Students of – Engineering (CS, IT, ECE, EEE)
Pre-Requisites	Some programming experience and familiarity with OO programming.
Contents	– State the advantages of an object-oriented approach to software development – Describe essential object-oriented concepts and terminology – Describe the fundamentals of object-oriented programming – Create Java classes that implement an object-oriented design – Apply Java language constructs that enable and enforce OO-related concepts such as data encapsulation, strict typing and type conversion, inheritance, and polymorphism – Use Java syntax to develop applications in Java – Use inheritance and interfaces in Java applications – Refactor Java code – Describe and use some of the important API classes and interfaces available in Java, including: o Primitive wrapper classes o Classes in the Collections Framework o Utility classes o I/O classes o Threads o Exceptions – Use the Java development tools in Eclipse V3.5 – Debug Java programs – Describe Java EE component model and its use in building server-side applications – Develop, debug, and test server-side applications – Develop and test servlets – Develop and test JSP pages – Learn how to use JSPs and servlets in accordance with the Model/View/Controller(MVC) programming model – Develop, test, and use JSP custom tags
Applicable IBM Certification	-
Follow on Courses	– IBM CE - Enterprise Applications Development using Rational Application Developer – IBM CE - Enterprise Applications for Cloud Environment using IBM Rational Application Developer & IBM SmartCloud – IBM CE - Fundamentals of Software Testing with IBM Rational Tools – IBM CE - Enterprise Mobile Application Development and Deployment using IBM Worklight – IBM CE - Fundamentals of Embedded Software development using IBM Rational Rhapsody (Java)

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Course Title: **DISCRETE MATHEMATICS**	Course Code: **DA3010**
Credit: **3.5**	L: **3** T: **1** P: **0**
Year: **2nd**	Semester: **III**

Unit I

Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs, Set Identities.
Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Order of relations.
Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions.
Natural Numbers: Introduction, Mathematical Induction.

Unit II

Partial order sets: Definition, Partial order sets, Combination of partial order sets, Hasse diagram.
Lattices: Definition, Properties of lattices – Bounded, Complemented and Complete Lattice
Boolean algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra. Combinational and sequential Circuits

Unit III

Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem,
Normal Subgroups, Permutation and Symmetric groups, Group Homeomorphisms, Definition and elementary properties of Rings and Fields, Integers modulo n.

Unit IV

Propositional Logic: Proposition, well-formed formula, Truth tables, Tautology, Contradiction, Algebra of proposition, Theory of Inference ,Natural Deduction.
Predicate Logic: First order predicate, well-formed formula of predicate, quantifiers, Inference theory of predicate logic.
Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle.
Probability: Introduction, Conditional Probability & Independence

Unit V

Graphs: Definition and terminology, Representation of graphs, multigraphs, bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring.
Trees: Definition, Binary tree, Binary tree traversal, binary search tree.
Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.

Text Book:

1. Liu C.L., Elements of Discrete Mathematics, McGraw Hill Int. edn.
2. Kolman B & Busby C.R., Discrete Mathematical Structure for Computer Science, Prentice Hall of India Ltd.
3. Deo N., Graph Theory, Prentice Hall of India.

Reference Book:

1. Trembley J.P. & Manohar R., Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill.

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Batch: 2016-20

Course Title: **COMPUTER ORGANISATION**	Course Code: **DA3020**
Credit: **3.5**	L: **3** T: **1** P: **0**
Year: **2nd**	Semester: **III**

Unit I : **Register Transfer and Micro operation**: Register Transfer Language, Bus and Memory Transfers, Bus Architecture, Arithmetic, Logic, Shift Microoperation, Design of ALU, Design of Fast adder.

Computer Arithmetic: Introduction, addition and subtraction algorithms, Booth Multiplication Algorithms, floating point arithmetic operation, IEEE format for floating point numbers.

Unit II : **Processor Organization**: General register organization, Stack organization, Addressing modes, Instruction format, Data transfer & manipulations, Program Control.

Control Design: Single and multiple bus architecture, Execution of a Complete Instruction, sequencing of control signals, Hardwired control, Micro programmed Control, microinstruction format.

Unit III : **Input-Output Organization**: I/O Interface, Modes of transfer, Interrupts & Interrupt handling, Direct Memory Access, Input-Output processor, Serial Communication.

Unit IV : **Memory Organization**: Memory Hierarchy, Main Memory (RAM and ROM Chips), organization of Cache Memory, Virtual Memory, Memory management hardware.

Unit V : **Parallel Processing**: Flynn's classification, Pipelining- Arithmetic Pipelining, Vector Processing, Array Processor.

Multiprocessor: Characteristic of Multiprocessor, Interconnection Structure, Interprocessor Arbitration.

Text Book:

1. M. Mano, Computer System Architecture, Pearson, 3rd Edition.
2. John P.Hayes, Computer Organization, McGraw Hill, 3rd Edition

Reference Book:

1. Vravice, Zaky&Hamacher Computer Organization, (TMH Publication)
2. Tannenbaum,Structured Computer Organization, (PHI)
3. Stallings ,Computer Organization, (PHI)

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Batch: 2016-20

Course Title: **Digital System Design**				Course Code: **FA3221**
Credit: 4.5	L	T	P	
	3	**1**	**2**	
Year: **2nd**				Semester: **III**

UNIT-1: INTRODUCTION **8 L**

Number Systems, Basic & Universal Logic gates, Boolean algebra, Direct Conversion of various base, Negative number representations, Floating point number representation, BCD & EXCESS-3 arithmetic, Error detecting and correcting codes: Hamming code, parity code, Review and Limitation of K-Map, Quine-Mcclusky Method (Tabular Method).

UNIT-2: COMBINATIONAL LOGIC CIRCUITS **8 L**

Characterization of digital circuits: Combinational & Sequential Logic circuit, Design procedure: Adders, Subtractors, Parallel Adder, IC-74LS83 and its applications, Multiplier, Decoder, Encoder, Priority Encoder, Multiplexers, Demultiplexers and their applications, Magnitude Comparators, Code Converters, Parity checker and generator, BCD Adder.

UNIT-3: SEQUENTIAL LOGIC CIRCUITS **6 L**

Latch, Flip-Flops and their conversions, Analysis and Synthesis of Sequential Circuits, Excitation Table & Diagram, Counters: Synchronous & Asynchronous, Shift Registers and their applications, Finite State Machine: Mealy and Moore Models.

UNIT-4: MEMORIES **8 L**

Memory Characteristics and operations , Sequential, Random Access-MOS & C-MOS Static and Dynamic Memory elements, Memory organization: One dimensional and Multidimensional Arrangement, Read Only Memory, ROM as a Decoder, Memory Bank, Address Decoding of Memory (Internal & External), PAL, PLA.

UNIT-5: LOGIC FAMILIES, HAZARDS & FAULT DETECTIONS **10 L**

Logic Families: Diode, BJT & MOS as a switching element, concept of transfer characteristics, ECL, TTL, I2L, Tri-state, PMOS,NMOS and CMOS logic families- Power Consumption, Gate delay and Figure of merit (SPP),Package density, Comparison of standard logic families, pass transistor Logic, Open Collector and Totem pole output stage for TTL. Static and Dynamic Hazards, Gate Delay, Generation of Spikes, Analysis & illustration of Hazard in Combinational Circuits, fault Detection Techniques: Path Sensitization, Boolean Difference Method, K- Map Method.

Text Books:

1. Digital Design, M. Morris Mano and M. D. Ciletti, 4th Edition, Pearson

Reference Books:

1. Digital Systems: Principles and Design, Raj Kamal, Pearson
2. Maini, Digital Electronics: Principles and Integrated Circuits, Wiley India.
3. Switching Theory and Finite Automata, Kohavi, TMH Publications.

Digital System Design Lab

1. Implementation of All Logic Gates using Universal gates (NAND & NOR both).
2. Bread-board implementation (Parallel adder, One bit Multiplier, One bit Magnitude comparator, parity checker)
3. Bread-board implementation of any one code converter (i.e. Gray Code, BCD Code, Excess-3, Hex. etc.).
4. Design of shift registers (SISO, SIPO, PIPO, and PISO), up and down counters.
5. Design of Mod-6 types of Asynchronous Counters.
6. Transfer characteristics of TTL and CMOS inverters.
7. Realization of Decoder, Multiplexer, encoder and De-multiplexers using IC 74138.
8. To design & Implement PAL.
9. To design & implement PLA.
10. Clock circuit realization using 555, CMOS inverter.

*Any two (Value Added)

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Course Title: **THEORY OF COMPUTATION**	Course Code: **DA4010**
Credit: **3.5**	L: **3** T: **1** P: **0**
Year: **2nd**	Semester: **IV**

Unit I : Mathematical preliminaries, alphabets, strings, languages, states, transition, transition graph, generalized transition graph, Deterministic Finite Automata, Non-Deterministic Finite Automata, Non-Deterministic Finite Automata with ϵ transitions, minimization of DFA.

Unit II : Conversions and Equivalence: Equivalence between NFA with and without ϵ transitions. NFA to DFA conversion; Equivalence between two DFA's, Limitations of FSM; Application of finite automata, Finite Automata with output- Moore & Melay machine and its conversion

Unit III : Regular Languages: Regular sets; Regular expressions, Arden's theorem, Construction of finite Automata for a given regular expression, Pumping lemma for regular sets. Closure properties of regular sets. Grammar Formalism: right linear and left linear grammars; Equivalence between regular linear grammar and FA,

Context free grammar; Derivation trees, sentential forms. Ambiguity in context free grammars; Normal forms: Chomsky normal form and Greibach normal form; Pumping Lemma for Context Free Languages, Closure property of CFL.

Unit IV : Push Down Automata: Push down automata, definition; Acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence; Equivalence of CFL and PDA; Introduction to DCFL and DPDA.

Unit V : Turing Machine: Turing Machine, definition, model, Design of TM, Computable functions Church's hypothesis, Types of Turing machines: Universal Turing Machine, Halting problem, Properties of recursive and recursively enumerable languages, unsolvable decision problem, undecidability of Post correspondence problem, Church turing Thesis.

Text Book:

1. Hopcroft H.E. and Ullman J. D ,"Introduction to Automata Theory Language and Computation",., Pearson Education.
2. J. C. Martin, "Introduction to Languages and the Theory of Computation",3rd edition, Tata McGraw-Hill.
3. C.K.Nagpal, "Formal Languages and Automata Theory", Oxford..

Reference Book:

1. Cohen, "Introduction to Computer theory", Wiley India."Elements of Theory of Computation", Lewis H.P. &Papadimitrou C.H. Pearson, PHI.

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Course Title: **Microprocessors**	Course Code: **FA52A0**
Credit: 4.5	L: **3** T: **1** P: **2**
Year: **3rd**	Semester: **V**

Unit 1

Introduction To Microprocessor: 8085 Evolution Of Microprocessor, Register Structure, ALU, Bus Organization, Timing And Control, instruction set.

Architecture of 16-bit Microprocessors: Architecture of 8086; (Bus Interface Unit, Execution unit) Register Organization, Bus operation, Memory segmentation.

Unit 2

Assembly Language Programming: Addressing Modes and instruction set of 8086, Arithmetic and Logic instructions, Program Control Instructions (jumps, conditional jumps, subroutine call) Loop and string instructions , Assembler Directives.

Unit 3

CPU MODULE: Signal Description of pins of 8086 and 8088, Clock generator, Address and Data bus Demultiplexing, Buffering Memory Organization, Read and Write cycle Timings, Interrupt Structures, Minimum Mode, Maximum Mode Operation.

Unit 4

Peripheral Interfacing: Programmed I/O, Interrupt Driven, I/O, DMA, Parallel I/O, (8255-PPI, Parallel port), 8253/8254 programmable Timer/Counter Interfacing with ADC.

Unit 5

Peripheral Interfacing (Contd.): 8259 Programmable Interrupt controller, 8237 DMA controller, Concept of Advanced 32 bit Microprocessors: Pentium Processor.

Text Book:

1. Ray,A.K. &Burchandi, K.M., "Advanced Microprocessors and Peripherals: Architecture, Programming and Interfacing", Tata McGraw Hill.
2. Hall D.V. , "Microprocessors Interfacing" ,2nd edition, Tata McGraw Hill

Reference Books

1. Gaonkar, Ramesh S., "Microprocessor Architecture, Programming, and Applications with the 8085", Pen Ram International Publishing , 5th edition
2. B.P. Singh &Renu Singh, "Microprocessors and Microcontrollers", New Age International.
3. Liu and Gibson G.A. , "Microcomputer Systems: The 8086/8088 Family", Prentice Hall (India), 2nd edition
4. Brey, Barry B. , "INTEL microprocessors", Prentice Hall (India), 4th edition
5. Ram B., "Advanced Microprocessor & Interfacing" , Tata McGraw Hill
6. Renu Singh & B.P. Singh, "Microprocessors and Interfacing & Applications", New Age International.

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Course Title: **COMPUTER NETWORKS**	Course Code: **DA4210**
Credit: **4**	L: **3** T: **0** P: **2**
Year: **2nd**	Semester: **IV**

Unit I : **Introduction:** Motivation, OSI model, Signals and media, Bits over signals, Synchronous communication, Modulation and modems, Bandwidth, Throughput, and noise, Time division and Frequency division multiplexing, Standards, Switching methods, ISDN.

Unit II : **Packet Transmission:** Multiplexing, Frames, Error correction techniques, LAN/WAN/MAN, Topology, CSMA/CD,LAN protocol, Elementary Data link protocol- Sliding window protocols, Token passing rings, FDDI, IEEE 802.3, 802.5.

Unit III : **Routing Algorithms:** Distance-Vector, Link-State, Shortest path computation, Dijkstra's algorithm, Congestion control, WAN technologies including frame relay, X.25, ATM.

Unit IV : **Internetworking:** Motivation, Concept, Goals, TCP/IP model, IP addressing with sub netting, Address binding with ARP, IP Datagram, Encapsulation IP fragmentation and reassembly, ICMP,IGMP,TCP.

Unit V : **Network Services:** Electronic mail, File transfer, Access and management, Virtual terminals, Remote procedure call.

Text Book:

1. Forouzan, B.A., Data communication and Networking, McGraw Hill (2006) 4th ed.
2. Tanenbaum, A.S., Computer Networks, Prentice Hall (2003) 4th ed.

Reference Book:

1. Comer, D.E., Internetworking with TCP/IP Vol. 1 Principles, Portals and Architecture, Prentice Hall of India (2005) 5th ed.
2. Stallings, W., Computer Networking with Internet Protocols and Tech., Prentice Hall of India (2007).

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Course Title: **WEB TECHNOLOGY**	Course Code: **DA4220**
Credit: **4**	L: **3** T: **0** P: **2**
Year: **2nd**	Semester: **IV**

UNIT 1

Web Essentials: Clients, Servers, and Communication. The Internet - Basic Internet Protocols - The World Wide Web-HTTP request message - response message - Web Clients Web Servers.

Markup Languages: An Introduction to HTML History-Versions-Basic Syntax and Semantics-Some Fundamental HTML Elements-Relative URLs-Lists-tables-Frames-Forms, Pages style sheets-CSS- Core Syntax- Properties-Box Model Normal Flow Box Layout-Other Properties.

UNIT 2

Client- Side Programming: The JavaScript Language-History and Versions Introduction JavaScript in Perspective-Syntax - Variables and Data Types – Statements – Operators – Literals – Functions – Objects – Arrays - Built-in Objects - JavaScript Debuggers, Browsers and the DOM.

PHP: Starting to script on server side, Arrays, function and forms, Advance PHP.

UNIT 3

Representing Web Data: XML-Documents and Vocabularies-Versions and Declaration-Namespaces JavaScript and XML: Ajax-DOM based XML processing Event-oriented Parsing: SAX-Transforming XML Documents-Selecting XML Data: XPATH-Template based Transformations: XSLT-Displaying XML Documents in Browsers-Case Study- Related Technologies, Introduction to JQuery.

UNIT 4

Web Services: Introduction to Web Services, UDDI, SOAP, WSDL, Developing and deploying web services. Ajax – Improving web page performance using Ajax, Programming in Ajax.

UNIT 5

Web 2.0: Interactive and social web**:** Blogs, wikis, and social networking sites – The technology behind these applications - AJAX, Open APIs.

Web 3.0: Semantic Web, Mashups, RDF, Web based Information Systems, Search engines, Recommender Systems, Web Mining.

Text Book:

1. Jeffrey C.Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.57

Reference Book:

1. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007.
2. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006.
3. Marty Hall and Larry Brown,"Core Web Programming" Second Edition, Volume I and II, Pearson Education, 2001.
4. Bates, "Developing Web Applications", Wiley, 2006.

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Course Name **IBM CE - Basics of Information Management with DB2**

Course Code IMDB2BIN / **DK 4250**

About Technology Information Management software offers you end-to-end capabilities to manage data and content, pull together information from diverse sources, and gain valuable insights to optimize business processes.

At the core of IBM's software solution for information management is a powerful family of relational database management system (RDBMS) servers, which provides the right capabilities to manage data and support operational and analytic applications. The integrated data management portfolio provides a modular environment to design, develop, deploy, operate, optimize, and govern data, databases, and data-driven applications. IBM also provides a unified, powerful data warehousing and business intelligence software that gathers, manages, and analyzes data.

About Course This course introduces the features, functions, and services provided by DB2, a relational database management system. Topics covered include: installation; data modeling and design; relational databases; database query languages; relational database design; distributed databases; physical database design; information storage and retrieval; and mapping DB2 vs. Oracle.

Target Audience The Information Management course enables students in early stages of undergraduate studies with an understanding of Relational Database Management concepts and its application in current day data management applications.

Students of:

- CS/IT/ ECE/EEE

Pre-requisites No previous Software knowledge, other than basic computer/Windows usage required.

Contents

Relational Databases	Installation and Planning
Data Modeling	Data Modeling and Database Design
Relational Databases	Introduction to RDBMS
	Understanding a table
	Relational Concepts
Database Query Languages	Simple SQL Queries
	Retrieving Data from Multiple Tables
	Scalar Functions and Grouping
Database Query Languages	Column Functions and Grouping
	Union
	Using Sub-queries
Relational Database Design	Views and Results during DB Design
	Problem Statement
Relational Database Design	Entity Relationship Model
Relational Database Design	Data and Process Inventories
Relational Database Design	Tuple Types
	From Tuple Types to Tables
Relational Database Design	Integrity Rules
Relational Database Design	Indexes
	Logical Data Structures
Distributed Databases	Distributed Data
Physical Database Design	Physical Implementation
	Intermediate SQL
	Maintaining Data
Information Storage and Retrieval	Creating and Accessing DB2 Databases
	Planning Disk Usage
	Data Migration Methods – Loading Tables
	Capacity Management
Information Storage and Retrieval	Data Moving Data
Mapping	DB2 vs. Oracle

Applicable Certification - NA -

Follow on courses

- IBM CE Introduction to Object -Oriented Programming using Java
- IBM CE - Fundamental Course in DB2 - Database Administration for Linux, Unix and Windows
- IBM CE - Fundamentals of Software Testing with IBM Rational Tools

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Batch: 2016-20

Course Title**: LINUX ADMINISTRATION AND SHELL PROGRAMMING**	Course Code: **DA4242**
Credit: **4**	L **3** T **0** P **2**
Year: **2nd**	Semester: **IV**

UNIT I
Introduction to Linux and Unix, What is an operating system?,A brief history of UNIX,Architecture of the Linux operating system,Logging into (and out of) UNIX systems,Changing your password,General format of UNIX commands. The UNIX filesystem, Typical UNIX directory structure ,Directory and file handling commands ,Making hard and soft (symbolic) links,Specifying multiple filenames,Quotes.

File and directory permissions ,Inspecting file content ,Finding files,Finding text in files,Sorting files,File compression and backup,Handling removable media ,Processes,Pipes,Redirecting input and output,Controlling processes associated with the current shell ,Controlling other processes

UNIT II
Introduction to vi,Basic text input and navigation in vi ,Moving and copying text in vi,Searching for and replacing text in vi,Other useful vi commands,Quick reference for vi ,Introduction to emacs,Basic text input and navigation in emacs,Moving and copying text in emacs,Searching for and replacing text in emacs,Other useful emacs commands ,Other UNIX editors. The superuser root,Shutdown and system startup,Adding users ,Controlling user groups ,Reconfiguring and recompiling the Linux kernel ,Cron jobs,Keeping essential system processes alive.

UNIT III
Unix Shell programming: Types of Shells, Shell Metacharacters, Shell variables, Shell scripts, Shell commands, the environment, Integer arithmetic and string Manipulation, Special command line characters, Decision making and Loop control, controlling terminal input, trapping signals, arrays.

UNIT IV
Introduction of python Shell script

Need for Python, Basic programming fundamentals, Data variables, Operators, First Python program ,Control Structures, String Inbuilt functions, Code flow, Indentation in Python, Knowledge about Python data structures with strings, lists, sets, tuples and dictionaries, Standard library modules introduction with examples. re module usage with functions like split, search, findall , compile etc.

UNIT V
Need of a file. Opening, closing and read/write operations in file., Python errors, exceptions, raising the exception and debugging concept, Basic OOP concepts, Creating classes and objects, Class variables and Object Variables, Method Invocation, Static, Class and Instance Methods, Relationships, Overloading methods, Data Hiding,

Database Programming using Python (Oracle database plugin), Web and CGI Programming using Python.

Text Book:

1. Sumitabh Das, "Unix Concepts and applications", TMH, 2003
2. Yashwant Kanitkar, "Unix Shell Programming", BPB, 2009

Reference Book :

1. Parata, "Advanced Unix programming guide", BPB
2. Meeta Gandhi, Tilak Shetty, Rajiv Shah, "The 'C' Odyssey Unix – the open boundless C", BPB.
3. Mike Joy, Stephen Jarvis, Michael Luck, "Introducing Unix and Linux", Palgrave Macmillan.
4. Rachel Morgan, Henry McGilton, "Introducing Unix System V", TMH

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Batch: 2016-20

Course Title: **Probability & Random Variable**	Course Code: **JA5010**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: 3rd	Semester: **V**

UNIT 1:

Theory of Probability & Concept of Random Variable

Axioms of probability: set theory, probability space, conditional, probability. Introduction, distribution and density functions, specific random variables, conditional distributions.

UNIT 2 :

Multiple Random Variables

Bi-variate distributions, one function of two random variables, two functions of two random variables, joint moments, joint characteristic functions, conditional distributions Multiple random variables, sequences of random variables

UNIT 3:

Concept of Stochastic Processes & Random Walks and Other Applications

Definition, systems with stochastic inputs, power spectrum, discrete-time processes. Random walks, Poisson points and shot noise, cyclo-stationary Processes, band-limited processes and sampling theory, deterministic signals in noise.

UNIT 4:

Spectral Representation and Estimation & Mean Square Estimation

Factorization and innovations, finite-order systems and state variables, spectral representation of random processes, ergodicity, spectrum estimation. Prediction, filtering and prediction, Kalman filters. Entropy: Basic concepts, random variables and stochastic processes, MEM.

UNIT 5:

Markov Chain & Queuing Theory

Introduction, higher transition probabilities and the Chapman-Kolmogorov equation, classification of states, stationary distributions and limiting probabilities, transient states and absorption probabilities, branching processes. Markov processes.

Characteristics of Queuing Theory, Queuing Models, Birth & Death Process, Little's Theorem.

Text Books:

1. Probability, Random Variables and Stochastic Processes/A. Papoulis & S. U. Pillai / 4th ed./TMH

Reference Books:

1. Probability, Random Variables & Random Signal Principles/Peyton Z. Peebles, Jr. / TMH

2. Probability & Queuing Theory, R. H. Chitale, Technical Publication Pune

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Course Title**: OPERATING SYSTEMS**	Course Code: **DA5020**
Credit: **3.5**	L T P **3 1 0**
Year: **3rd**	Semester: **V**

Unit I

Introduction: Components of a computer System, Operating system: User view & System view, Evolution of operating system, Single Processor & Multiprocessor systems, Real Time System, Distributed Systems, Multimedia Systems, Handheld Systems.

Operating System Structure: Operating System Services, User Operating System Interfaces: Command-Line and GUI, System Calls,

Unit II

Process Management: Process Concept, Process States, Process Transition Diagram, Process Control Block (PCB).
CPU Scheduling: Scheduling Concepts, Performance Criteria, Scheduling Queues, Schedulers, Scheduling Algorithms: Preemptive & Non Preemptive: FCFS, SJF, Priority, Round-Robin.

Unit III

Concurrent Processes: Principle of Concurrency, Producer / Consumer Problem, Co-operating Processes, Race Condition, Critical Section Problem, Peterson's solution, Semaphores, Classical Problem in Concurrency- Dining Philosopher Problem; Inter Process Communication models and Schemes.

Deadlock: System Model, Deadlock Characterization, Prevention, Avoidance and Detection, Recovery from deadlock.

Unit IV

Memory Management: Bare machine, Resident monitor, Multiprogramming with fixed partition, Multiprogramming with variable partition, Multiple base register, Paging, Segmentation, Virtual memory concept, Demand paging, Performance, Paged replaced algorithm, Allocation of frames, Cache memory.

Unit V

File System: Different types of files and their access methods, various allocation methods.

I/O Management and Disk Scheduling: I/O Devices, Organization of I/O functions, Disk Structure, Disk Scheduling (FCFS, SSTF, SCAN, C-SCAN, LOOK).

Text Book:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley.
2. D M Dhamdhere, "Operating Systems : A Concept based Approach", 2nd Edition.

Reference Book:

1. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education. Harvey M Dietel, " An Introduction to Operating System", Pearson Education

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Course Title**: ALGORITHMS: ANALYSIS & DESIGN**	Course Code: **DA5210**
Credit: **4**	L T P **3 0 2**
Year: **3rd**	Semester: **V**

Unit-I

Introduction: Algorithms, Performance Analysis: Space and Time Complexity, Asymptotic Notations- Big Oh, Omega, theta notations, finding complexity of the algorithm, Linear Sorting: Insertion sort, Bubble sort, selection sort.

Unit -II

Advanced Data structures: B-Tree, Binomial Heaps, Fibonacci Heaps, Red & Black Tree.
Divide and Conquer: General method, binary search, quick sort, merge sort, heap sort,

Unit -III

Greedy Method: General method, Activity Selection, job scheduling with deadlines, fractional knapsack problem, Minimum cost spanning tree: Kruskal's and Prim's, single source shortest path, Huffman tree.
Amortized analysis
Unit - IV

Dynamic Programming: General Method, 0-1 Knapsack, Matrix chain multiplication, longest subsequence, all pair shortest paths,
Backtracking- Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.

Unit -V

Branch and Bound: Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.
NP-Hard and NP-Complete problems: Basic Concepts, non-deterministic algorithms, NP-Hard and NP-Complete classes , Cooks Theorm.

Text Book:

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, "Introduction to Algorithms", PHI Pvt. Ltd., 20012.
2. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia,2003 3.
3. M.T.Goodrich and R.Tomassia , Algorithm Design: Foundations, Analysis and Internet examples, Johnwiley and sons.

Reference Book:

1. R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, Introduction to Design and Analysis of Algorithms A strategic approach, McGraw Hill.
2. Aho, Ullman and Hopcroft ,Design and Analysis of algorithms, ,Pearson education.
3. Ellis Horowitz, Satraj Sahni and Rajasekharam, Fundamentals of Computer Algorithms, Galgotia publications pvt. Ltd.

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Course Title**: CLOUD APPLICATION DEVELOPMENT**	Course Code: **DK5210**
Credit: **4**	L: **3** T: **0** P: **2**
Year: **3rd**	Semester: **V**

Course Objective:

The Cloud Application Developer career path prepares students to develop, build, and test mobile data applications using a cloud platform to build Software as a Service (SaaS) solutions. This will require cloud application development skills, such as Node.js, REST architecture, JSON, Cloud Foundry and DevOps services. The Cloud Application Developer will use tools to build, deploy, run and manage applications on a cloud platform.

Unit I : **Introduction to HTML5 and JavaScript Programming:** Describe what HTML does, List the objectives of HTML5,Describe the document types that are supported in HTML5,Describe the document object model (DOM) tree, some of the differences between HTML4 and HTML5,List some HTML document API properties and methods, how scripting is enabled in browsers, browser support for HTML5 features

Describe JavaScript primitives and objects, how variables are declared and used in JavaScript

Describe JavaScript control structures, Describe functions in JavaScript, Describe the document object model (DOM) hierarchy, Describe the window and document objects

Identify the DOM objects that are commonly used in JavaScript applications for working with HTML documents, Create HTML web pages, Use style statements in HTML documents, Connect scripts to documents, Write JavaScript functions, Create interactive alert and confirm window objects

Use JavaScript to modify the document object model (DOM).

List new elements in HTML5, Describe HTML5 structural elements: section, article, header, footer, figure, fig caption, Describe the attributes of the HTML5 input element: tel, email, datetime, number, range, color.

Create a web page and insert a simple HTML5 form layout, Add new markup elements, Use input types that include attributes such as email to perform client-side validation

Test the application. How the course met its learning objectives, Submit an evaluation of the class, Identify other Web Application Server Education courses that are related to this course, Access the Web Application Server Education website, Locate appropriate resources for further study

Unit II : **Essentials of Cloud Application Development:** Define cloud computing, the factors that lead to the adoption of cloud computing, the choices that developers have when creating cloud applications, infrastructure as a service, platform as a service, and software as a service, Describe a development platform, Describe the architecture of a development platform
Identify the runtimes and services that a development platform offers.

Describe the cloud development platform's infrastructure types, how to create an application in a cloud development platform, cloud development platform's dashboard, catalog, and documentation features, how the application route is used to test an application from the browser, how to bind services to an application in the cloud development platform, the environmental variables used within the services of the cloud development platform, cloud development platforms organizations, domains, spaces and users.

How to manage your account with the Cloud Foundry CLI, how to create a Node.js application that runs on the cloud development platform the features in the cloud development platform that help you set up a cooperative workstation environment, how to setup and use the cloud application development platform's plug-in for Eclipse, the role of Node.js for server-side scripting.

Set up a cloud application trial account, Log in to the cloud application from a browser session, InitializeCreater' your cloud application account, Create a cloud application from an existing template,Add a service to the application from the service catalog, Test the application with the resource endpoint once the application has started ,Follow getting started option on the cloud development platform to use the CLI, Install Cloud Foundry CLI , Deploy an app from local source code using the Cloud Foundry CLI, Test the application with the resource endpoint after the app is started.

Download the Eclipse and required plugins for developing cloud applications on Eclipse, Configure Eclipse to work with the cloud development platform, Push applications from Eclipse to the cloud development platform

Describe the cloud development platform's DevOps services, Describe the capabilities of the DevOps services
Briefly highlight the web IDE features in the DevOps services

Describe how to connect the Git repository client to your DevOps services project Explain the pipeline build and deploy processes used by DevOps services Describe how DevOps services integrate with the cloud development platform, Describe the agile planning tools in the cloud development platform.

Sign in to DevOps, Explore public projects in DevOps, Sign in to the cloud development platform and DevOps

Create a Git repository in DevOps services to manage your source code, View and edit code in DevOps, Build and deploy code from DevOps to the cloud development platform, Test the application on the cloud development platform.
Describe the characteristics of REST APIs. , Explain the advantages of the JSON data format. Example of REST APIs using Watson.

Unit III : C**loud Development Platform:** Describe the main types of data services in a cloud development platform, Describe the benefits of Cloudant, Explain how Cloudant databases and documents are accessed from the cloud development platform, Describe how to use REST APIs to interact with Cloudant database, Create a starter Node.js application with a Cloudant DB service from a Cloud development platform boilerplate, Review the service environment variables Download the application package to the workstation, Review the application source code Push the application to the cloud development platform, Access the Cloudant console and documentation Explore the features of the Cloudant dashboard, Run the Cloudant application, Run the application and add data to the Cloudant database, Verify the data that is store in the database from the Cloudant dashboard.

Describe the cloud development platform's Mobile Backend as a Service (MBaaS), Describe the MBaaS architecture, Describe the Push Notifications service, Describe the Mobile Client Access service, Describe the Mobile Quality Assurance service, Describe how to create mobile applications by using MobileFirst Services Starter Boilerplate.
Create a MobileFirst Services Starter application on a cloud development platform, Set up the Android development environment, Clone the mobile application from DevOps, Configure the front end of the application

Install the Android virtual device, Run the Android application on mobile emulator.

Create a MobileFirst Services Starter application on the cloud development platform, Configure Google Cloud Messaging Service, Configure the Push Notifications service, Clone the mobile application from Github.
Configure the front-end mobile app, Run the Android application on a mobile device emulator
Send push notifications from the cloud development platform and receive them on the mobile device emulator.

Unit IV: **Developing Cloud Applications with SDK for Node.js:** Explain the origin and purpose of the Node.js SDK JavaScript framework, simple web server with JavaScript, Import the Node.js SDK modules into your script, Create an SDK for Node.js application, First Node.js application, Deploy a Node.js SDK application on a cloud platform, Create a Node.js module and use it in your code. Explain the concept of anonymous callback functions, Create a callback function to intercept network traffic, Parse network traffic with sockets, Understand asynchronous callbacks, code in a Node.js application

.

Unit V : **Express web application Framework:** Define a package dependency, Create an Express server object, Handle inbound HTTP method calls for a server resource, and Create a callback function to intercept HTTP method calls. Parse JSON data from an HTTP message-, Create a Hello World Express application, Create Simple HTML view for your application, Understand Express routing, Use third-party modules in Node.js.

Understand the Watson Natural Language Understanding service Clone a cloud application, Use Bootstrap to create a responsive web page, Use AngularJS, Controllers to create interactive web pages, Use AngularJS Services to, interact with back-end web services Use AngularJS directives, such as ng- repeat, to enrich your user interface (UI).

Learning Outcomes:

Having successfully completed this course, the student can:

1. Describe the emerging paradigms that are leading to the adoption of cloud computing
2. Describe Infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS)
3. Describe the features of cloud development platforms
4. Describe the underlying components of cloud development platforms
5. Create a cloud development platform application
6. Deploy and run a cloud development platform application

Reference Book:

1. IBM COURSEWARE.

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cloud Computing
Batch: 2016-20

Course Title**: ARTIFICIAL INTELLIGENCE**	Course Code: **DA5230**
Credit: **4**	L T P **3 0 2**
Year: **3rd**	Semester: **V**

Unit-1

Introduction- Definitions, Intelligent Agents, Problem solving and Search- Uninformed Search, Informed Search, MiniMax Search, Constraint Satisfaction Problem.

Unit-2

Prolog-Introduction to Prolog, Syntax and Meanings of Prolog Programs, Operators and Arithmetic, Prolog for Artificial Intelligence.

Unit-3

Knowledge Representation- Introduction, Approaches and Issues in Knowledge Representation, Propositional Logic and Inference, First-Order Logic and Inference, Unification and Resolution.

Unit-4

Reasoning- Introduction, Types of Reasoning, Probabilistic Reasoning, Probabilistic Graphical Models, Certainty factors and Rule Based Systems, Introduction to Fuzzy Reasoning.

Unit-5

Planning and Learning- Introduction to Planning, Types-Conditional, Continuous, Multi-Agent.
Introduction to Learning, Categories of Learning, Inductive Learning, Reinforcement Learning, Decision Tree Learning, Basic Introduction to Neural Net Learning.

Text Book:-

1. Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education Asia, Third Edition, 2015.
2. Elaine Rich, Kevin Knight and Shivashankar B.Nair, “Artificial Intelligence”, Tata McGraw-Hill, Third edition, 2009.
3. Nils J.Nilsson, “Artificial Intelligence - A New Synthesis", Harcourt Asia Pvt. Ltd., Morgan Kaufmann, 1988.

References Book:-

1. Ivan Bratko, “Prolog Programming for Artificial Intelligence”, Pearson Education Asia, First Edition, 2007.
2. Dan W. Patterson, “Introduction to Artificial Intelligence and Expert Systems”, PHI Learning, Second Edition, 2005.

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cloud Computing
Batch: 2016-20

Course Title: **Principles of Management**	Course Code: **HA5010**
Credit: 2	L: **2** T: **0** P: **0**
Year: **3rd**	Semester: **VI**

UNIT – 1

Introduction to Management

Theories of management: Traditional behavioral, contingency and systems approach. Organization as a system.

UNIT – 2

Management Information

Interaction with external environment, Managerial decision making and MIS.

UNIT – 3

Planning Approach to Organizational Analysis

Design of organization structure; Job design and Enrichment; Job evaluation and merit rating.

UNIT – 4

Leading and Control

Theories of motivation, Leadership styles and managerial grid. Co-ordination, Monitoring and Control in organizations. Techniques of Control. Japanese management techniques.

Minor Project: Submission of 15 pages of Case Studies on above.

Suggested Books:

1. Peter Drucker, Harper and Row: The Practice of Management.
2. *Koontz H*, Weihrich,H. Essentials of Management, *Tata McGraw-Hill* Education, 2006.
3. Schermerhorn, John R. Management and Organizational Behavior Essentials, Wiley India,2005
4. Staner: Management, PHI Learning
5. Hirschey. Managerial Economics, Cengage Learning, 2009.
6. Chhabra, A. Principle of Management, Sun India publication , 2012

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cloud Computing
Batch: 2016-20

Course Title**: COMPUTER GRAPHICS**			Course Code: **DA6210**
Credit: **4**	L	T	P
	3	**0**	**2**
Year: **3rd**			Semester: **VI**

Unit I : **Introduction to computer graphics and primitives algorithms:** Points, planes, pixels and frames buffers, lines, circles and ellipse drawing algorithms, display devices, primitive devices, applications of computer graphics.

Unit II : **Two-Dimensional Transformation:** Introduction to transformation matrix, **Types of transformations in 2-D:** Identity Transformation, Scaling, Reflection, Shear Transformation, Rotation, Translation, Rotation about an arbitrary point, Combined Transformation, Homogeneous coordinates, 2-D transformation using homogeneous coordinates.

Unit III : **Three-Dimensional Transformation:** Objects in homogeneous coordinates, **3-D Transformation:** Scaling, Translation, Rotation, Shear Transformations, Reflection, world coordinates and viewing coordinates, Projection, parallel Projection, Perspective projection. **Hidden Lines and Surfaces:** Back face removal algorithms, Hidden lines methods..

Unit IV : **Viewing and Solid Area Scan-Conversion:** Introduction to viewing and clipping, viewing transformation in 2-D, Point Clipping, Line Clipping, Introduction to polygon Clipping, Viewing and clipping in 3-D, Three Dimensional Viewing Transformations, Text Clipping, generalize Clipping, Multiple windowing.

Introduction to Solid Area Scan: Conversion, Inside-Outside Test, Winding Number Method and Coherence Property, Polygon Filling, Seed Fill Algorithms, Scan Line Algorithm, priority Algorithm, Scan Conversion of Characters, Aliasing, Anti-aliasing, Halfoning, Threshold and Dithering.

Unit V : **Introduction to curves:** Curves Continuity, Conic Curves, Piecewise Curve Design, Spline curve representation, Bezier Curves, Fractals and its Applications.

Object rendering: Introduction to Object Rendering, Shading, Ray Tracing, Illumination model, Colour Models.

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Text Book:

1. R.K. Maurya, Computer Graphics, John Willey.
2. David F. Rogers, Procedural Elements of Computer Graphics, Tata McGraw Hill.

Reference Book:

1. Donald hearn and M.Pauline Beaker, Computer Graphics, Prentice Hall of India.
2. Steven Harrington, Computer Graphics, McGraw Hill.

Department of Computer Science & Engineering
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Batch: 2016-20

Course Title**: DOT NET TECHNOLOGIES**	Course Code: **DA6220**
Credit: **4**	L T P **3 0 2**
Year: **3rd**	Semester: **VI**

Unit I : **Introduction to C#:** C# Language Fundamentals: An Anatomy of a basic class, Creating objects: Constructor basic, the composition of an application, Default Assignment and variable scope, member initialization syntax, Basic input and output with the console class, Understanding value types and reference types, the master node: System. Objects, The system Data type (And C# aliases), Converting between value type and reference type: Boxing and Unboxing, Defining program constraints, Iterations constructs, control flow constructs, The complete set operator, Defining Custom class methods, Understanding static methods, Method parameter modifiers, Array manipulation, String manipulation, Enumerations, Defining structures, Defining custom namespaces.

Unit II : **Object Oriented Aspects Of C#:** Formal definition of the class, Definition the "Default public interface" of a type, Recapping the pillars of OOP, The first pillar: Encapsulation services, Pseudo Encapsulation: Creating read only field, The second pillar: Inheritance supports keeping family secrets: The "Protected" keyword, The Nested type definitions, The third pillar: Polymorphic support casting between types, Generating class definitions using Visual Studio.Net. Exceptions and Objects Life Time Ode to errors, Bugs and exceptions, the role of .NET exceptions handling, the system. Exception base class throwing a generic exception catching exception, CLR system level exception(System. system exception), Custom application level exception (System. application exception), Handling multiple exception, The finally block The last chance exception, dynamically identify application and system level exception, Debugging system exception using VS.Net, Understanding Object life time, The CIT of new, The basic of garbage collection, Finalizing a type, Finalization process, building and Ad hoc destruction method, garbage collection optimization, The system .GC type.

Unit III : **The Clr And The .Net Framework:** The building Block of the .NET platform (CLR,CTS,CLS), the role of the .NET base class libraries, , additional .NET Aware programming Languages, Understanding .Net Assembles, Problems with classic COM Binaries, The role of the common intermediate language, The role of .NET type metadata, The role of the assembly manifest, Compiling CIL to platform specific instruction. Building a simple file test assembly, Cross Language Inheritance. Building the multi file assembly, Using the multi file assembly, Understanding private assemblies, robing for private assemblies (The Basics), Private assemblies and XML Configuration files, Probing for private assemblies (The details),Understanding Shared assembly, Understanding Shared Names, Building a shared assembly, Understanding delay Signing, Installing/Removing shared assemblies, Using a Shared assembly.

Unit IV : **Application Development On .Net:** Using the visual studio.Net IDE, key aspects of the VS.Net IDE, Documenting source code via XML, Building Windows Applications, Event Driven Programming, Delegate, Event and its association, Synchronous and asynchronous operation with delegate, User Defined events and delegates,ADO.NET Architecture,.NET Framework Data Providers, Data set, Data reader, data adapter, Accessing Data with ADO.NET..

Unit V : **Web Based Application Development On .Net:** Introduction to web form, Need of Web Application, Static and Dynamic Page, Working of IIS and Browser, Differences between ASP and ASP.NET, understanding post back, understanding page life cycle, State management, Server control form validation, Master pages, ASP.NET web security, server control form validation, Programming Web Applications with Web Forms, Web service, Programming Web Services

Text Book:

1. E. Balagurusamy, "Programming in C#", Tata McGraw-Hill, 2004. (Unit I, II)
2. J. Liberty, "Programming C#", 2nd ed., O'Reilly, 2002. (Unit III, IV, V)

Reference Book:

1. Herbert Schildt, "The Complete Reference: C#", Tata McGraw-Hill, 2004.
2. Robinson et al, "Professional C#", 2nd ed., Wrox Press, 2002.
3. Andrew Troelsen, "C# and the .NET Platform", A! Press, 2003.
4. S. ThamaraiSelvi, R. Murugesan, "A Textbook on C#", Pearson Education, 2003.

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B.Tech. (CSE) with Specialization in Cloud Computing
Batch: 2016-20

Course Title**: COMPILER DESIGN**	Course Code: **DA6230**
Credit: **4**	L T P **3 0 2**
Year: **3rd**	Semester: **VI**

Unit I : **Introduction:** Review of Languages & Grammar, Compiler and Interpreter- Basic Concepts. Phases and Passes, Design Issues using Finite State Machines, Scanner Generator- LEX. Formal Grammar and their application to Syntax Analysis, Ambiguous Grammar, The Syntactic specification of Languages: CFG, Derivation and Parse Trees, Capabilities of CFG, BNF Notation.

Unit II : **Basic Parsing Techniques:** Parsing-Top Down and Bottom-Up Strategies: General Consideration. Top Down Parsing: Brute-Force Method, Recursive Descent, & Predictive Paring. Bottom-Up Parsing: Shift Reduce Parsing, Operator Precedence Parsing. LR Grammars-LR(0), SLR(1), Canonical LR(1) & LALR(1) Parser, Comparison of parsing methods.

Unit III : **Semantic Analysis:** Basic Concepts, Syntax Directed Definitions-Inherited & Synthesized Attributes, Evaluation Orders of SDDs. Syntax directed Translation Schemes, Intermediate Codes, Postfix notation, Parse Trees and Syntax Trees, Directed Acyclic Graphs, Three address Codes: Quadruple & Triples, Translation of Assignment Statements, Boolean expressions, Control Statements, Postfix Translation, Translation with a Top Down Parser, Array References in Arithmetic expressions, Procedure Calls, Declarations and Case statements Translations.

Unit IV : **Symbol Tables:** Organization of Non-Block Structured Language (Unordered /Ordered/ Tree/ Hash) and Block Structured Language (Stack Tables & Stack Implementation), Runtime Storage Management: Static Allocation, Dynamic Allocation- Activation Records and their usage, Recursive Procedure. Heap Allocation-Storage Registers and Release Strategies.

Unit V : **Error detection and Recovery:** Code Optimization- Basic Blocks and Optimization, Loop Optimization, Flow Graph Analysis, Machine Dependent Optimization.

Error Handling: Detection, Reporting, Recovery and Maintenance, Compiler-Compiler—YACC, Code Generation, Concept of Compiler Design for Object-Oriented Language.

Text Book:

1. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, "Compilers-Principles, Techniques & Tools", Pearson Education

Reference Book:

1. Robin Hunter, " Essence of Compilers", Pearson Education
2. Steven S. Muchnick, Advanced Compiler Design & Implementation, Morgan Kaufmann Publishers

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cloud Computing
Batch: 2016-20

Module Title : OOAD & Software Development Life Cycle
Course Code : DK 6050

Indicative Contents:

Coverage
Best Practices of Software Engineering, Concepts of Object Orientation, Essentials of Visual Modeling
Requirements Overview, Analysis and Design Overview, Architectural Analysis, Use-Case Analysis
Identify Design Elements, Identify Design Mechanisms
Describe the Run-time Architecture, Describe Distribution, Use-Case Design, Objectstore Mechanism, Security Mechanism, UML to C++ Mapping, UML to Java Mapping, UML to Visual Basic Map, UML to Visual Basic Map

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Batch: 2016-20

Course Title: **Engineering Economics**			Course Code: **GC5010**
Credit: 2	L	T	P
	2	**0**	**0**
Year: **3rd**			Semester: **VI**

UNIT-I

Time value of money: Simple and compound interest, Time value equivalence, Compound interest factors, Cash flow diagrams, Calculation, Calculation of time –value equivalences. Present worth comparisons, Comparisons of assets with equal, unequal and infinite lives, comparison of deferred investments, Future worth comparison, payback period comparison.

UNIT-II

Use and situations for equivalent annual worth comparison, Comparison of assets of equal and unequal life. Rate of return, Internal rate of return, comparison of IIR with other methods, IRR misconceptions.

UNIT-III

Analysis of public Projects: Benefit/ Cost analysis, quantification of project, cost and benefits, benefit/ cost applications, Cost –effectiveness analysis.

UNIT-IV

Depreciation, computing depreciation charges, after tax economic comparison, Break-even analysis; linear and non-linear models. Product and Process Costing, Standard Costing, cost estimation, Relevant Cost for decision making, Cost control and Cost reduction techniques.

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Course Title: **MOBILE COMPUTING**	Course Code: **DA6640**
Credit: **3**	L: **3** T: **0** P: **0**
Year: **4th**	Semester: **VI**

Unit I

Introduction: Introduction to mobile computing. Convergence of Internet, digital communication and computer networks. Sharing of wireless channels: FDMA, TDMA, CDMA. MAC layer issues in wireless communication

Unit II

Mobility Management: Impacts of mobility and portability in computational model and algorithms for mobile environment. Disconnected operation, handling handoffs. Analysis of algorithms and termination detection.Types of Mobility. Mobility in cellular based wireless network: channel allocation, interferences, handoffs and location management. IP mobility: Mobile IP and IDMP

Unit III

Wireless LAN: Infrared vs. Radio transmission, Infrastructure and Ad hoc Networks, IEEE 802.11: System architecture, Protocol architecture, Physical layer, Medium access control layer, MAC management, Future development; HIPERLAN: Protocol architecture, Physical layer, Channel access control.Sub layer, Medium access control Sub layer, Information bases and Networking; Bluetooth: User scenarios, Physical layer, MAC layer, Networking. Security, Link management. Personal Area Network: Bluetooth and ZigBee. Network layer issues ad hoc and sensor networks

Unit IV

Data Models: Data delivery models: push and pull. Data dissemination in wireless channels. Broadcast disks. Effects of caching,Indexing in Air, Mobile Databases and transaction

Unit V

Distributed Mobile Environment: Distributed file system for mobile environment, Mobile Middleware: Service discovery, adaptation, mobile agents.

Text Book:

1. Schiller, “Mobile Communications”, PHI/Pearson Education, Second Edition.
2. William Stallings, “Wireless Communications and Networks”, PHI/Pearson Education.

Reference Book:

1. T. Rappaport, "Wireless Communication: Principles and Practice", Pearson Education.
2. Reza B'Far (Ed), "Mobile Computing Principles", Cambridge University Press.

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Batch: 2016-20

Course Title**: DATA BASE ADMINISTRATION**	Course Code: **DA6650**
Credit: **3**	L T P **3 0 0**
Year: **4th**	Semester: **VI**

UNIT I Introduction

Oracle Architectural Components, Getting Started With Oracle Server , Managing an Oracle Instance, Creating a Database, Data Dictionary Contents and Usage, Maintaining the Control File, Redo Log Files, Managing Tablespaces and Data Files, Storage Structures and Relationships, Managing Undo Data, Tables, Indexes, Maintaining Data Integrity, Managing Password, Managing Security, Resources, users, Privileges & Roles, Loading Data Into a Database & Globalization Support

UNIT II DBA Fundamentals

Networking Overview, Basic Oracle Net Architecture, Server-Side Configuration, Basic Oracle Net Services Client-Side Configuration, Usage and Configuration of the Oracle Shared Server, Backup and Recovery Overview, Instance and Media Recovery Structures, Configuring the Database Archiving Mode, Oracle Recovery Manager Overview and Configuration, User Managed Backups, RMAN Backups, User Managed Complete & Incomplete Recovery, RMAN Complete Recovery, Incomplete Recovery & Maintenance, Recovery Catalog Creation and Maintenance, Transporting Data Between Databases

UNIT III Performance Tuning

Overview Of Oracle 9i Performance Tuning, Diagnostic and Tuning Tools, Sizing the Shared Pool & the Buffer Cache, Sizing The Other SGA Structures, Database Configuration and I/O Issues, Optimizing Sort Operations, Diagnosing Contention For Latches, Tuning Rollback Segments, Monitoring and Detecting Lock Contention, Tuning The Oracle Shared Server, Application Tuning, Using Oracle Blocks Efficiently SQL Statement Tuning, Tuning the OS and Using Resource Manager

UNIT IV Managing Oracle

Oracle10i: Overview, Preparing the Operating System & Install Oracle9i Software, Create a Custom Oracle Database, Install and Configure Enterprise Manager, Customize the Oracle Database Linux Measurement Tools, Oracle Measurement Tools, Tuning Oracle

UNIT V Database Troubleshooting

One Time Troubleshooting, Adhoc Troubleshooting, Escalations, Connectivity, Business Continuity, High Availability and Scalability, Data Sharing and information Integration

Text Book:

1. Oracle Database Administrator's Guide
2. Oracle DBA Handbook

Reference Book:

1. Michael Wessler Oracle DBA on Unix and Linux

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Batch: 2016-20

Course Title: **Genetic Algorithms & Probabilistic Reasoning**	Course Code: **DA6620**
Credit: **3**	L: **3** T: **0** P: **0**
Year: **3rd**	Semester: **VI**

UNIT 1 **(8L)**

Fuzzy Sets (Introduction)

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory, Basic operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

UNIT2 **(8L)**

Fuzzy Logic (Fuzzy Membership, Rules)

Membership functions, Propositional logic and predicate logic, Inference in fuzzy logic, Fuzzy if-then rules, Fuzzy mapping rules, Fuzzy implications, Min-Max Theorem, Resolution Rule under Fuzzy environment, Refutation method for theorem proving, Defuzzifications,

UNIT3 **(8L)**

Reasoning with uncertain and incomplete information: The statistical approach to uncertainty, Introduction, Uncertain & incomplete knowledge. Review of Probability theory

UNIT4 **(8L)**

Bayes Theorem, Bayesian Networks, Bayesian reasoning. Decision Making, Joint Probabilities, Relationships, Polytrees., Dempster-Shafer theory of evidence, Certainty Factor, Non-monotonic systems.

UNIT 5 **(8L)**

Theoretical Foundation of Genetic Algorithms

Introduction: Basic Operators: Reproduction, Crossover & Mutation. Fitness function. Search Space, Schemas & Two-Armed and k-armed problem, Exact mathematical models, Applications of Genetic Algorithms.

Text Book:

1. G.J.Klir , Yuan,"Fuzzy Sets and fuzzy logic, Theory and applications", Prentice Hall India, 1995.
2. David E. Goldberg, "Genetic algorithms in search, optimization & Machine Learning" Pearson Education, 2006
3. Stuart Russel, Peter Norvig, "Artificial Intelligence A Modern Approach" Pearson (3rd Ed.)

Reference Book:

1. John Yen, Reza Langari, "Fuzzy Logic Intelligence, Control and Information", Pearson Education, 2006.
2. Timothy J Ross, "Fuzzy Logic with Engineering Applications", 2nd Edition, John Wiley, 2004.
3. H. Zimmermann, "Fuzzy Set Theory and its applications", 2nd Edition, Allied Publishers, 1996.
4. Melanle Mitchell, "An introduction to genetic algorithms", Prentice Hall India, 2002.

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cloud Computing
Batch: 2016-20

Course Title**: INTELLIGENT SYSTEMS**			Course Code: **DK6210**
Credit: **4**	L	T	P
	3	**0**	**2**
Year: **4th**			Semester: **VI**

Course Objective:

The Artificial Intelligence career path prepares students to apply AI in real-life. This will require skills in Cognitive Computing, Natural Language Processing (NLP), Conversation (Chatbots), and Computer vision. Training topics will include AI, IBM Watson, hands-on and case studies on NLP, Chatbots, and Vision.

Unit 1 ARTIFICIAL INTELLIGENCE OVERVIEW

Describe the eras of computing, Explain the difference between deterministic and probabilistic systems, Describe the types of AI, Explain what the main focus of AI is, Explain what machine learning is, Describe the types of machine learning, Explain what neural networks are and why they are important in today's AI's field Explain what domain adaptation is and its applications, Explain what NLP is, Describe different NLP, processes, List tools and services for NLP, Identify NLP use cases, Define CV, Know the history of CV and its advancement with AI, List tools and services for CV, Identify CV use cases, Explain what cognitive computing is, Describe the characteristics of cognitive systems, Explain the landscape of cognitive computing in the industry, Setup your IBM Bluemix Account.

Unit 2: ARTIFICIAL INTELLIGENCE FOUNDATIONS

Explain what IBM Watson is and how it works, Explain How Watson technology is made available to developers and organizations, Describe how Watson technology is being applied to solve real world problems, Explain what the Deep QA architecture was, Explain why IBM decided to commercialize Watson, Describe the evolution of Watson services from the original DeepQA architecture to the present, Recognize the Watson services available today on the IBM Cloud, List the Watson services, Explain the capabilities of each Watson service, Describe the purpose of training the various Watson services to adapt them to a closed domain, List the Watson services that can be trained, List the Watson services that cannot be trained, Describe what Watson Knowledge studio is, List the Watson services that can be trained with Watson Knowledge Studio, Use Watson API Explorer to interact with the Watson services REST API, to test your calls to the API, and to view live responses from the server, Use Watson API Explorer to become familiar with Watson services.

Unit 3: ARTIFICIAL INTELLIGENCE ANALYST - Natural Language Processing

Explain what NLP is, Describe different NLP processes, List tools and services for NLP, Identify NLP use cases, Define different components of NLP, Define challenges within NLU, Explain the NLP pipeline, Explain the concepts of information extraction and sentiment analysis, Define the capabilities of IBM Watson Natural Language Classifier (NLC), Describe how to train Watson NLC, Define the capabilities of Watson Natural Language Understanding (NLU) service and its input and output, along with the discovery

service, Explain the capabilities of the Watson Tone Analyzer service and its input and output, Create a Watson Discovery service instance, Create a collection, Add content to a collection, Build queries, Use the Discovery API.

Unit 4: ARTIFICIAL INTELLIGENCE ANALYST – Chatbots

Explain what a chatbot is, Describe common applications of chatbots, Identify factors that drive the growing popularity of chatbots, List examples of tools and services that you can use to create chatbots, What a workspace is, What an intent is, What an entity is, What a dialog is, What dialog nodes are, How the nodes in a dialog are triggered, How the dialog flow is processed, The advanced features of a chatbot, Create a workspace, Build a dialog, Create a Watson Conversation service instance, Create a Conversation workspace, Add intents, Build a dialog, Test in Slack.

Unit 5: ARTIFICIAL INTELLIGENCE ANALYST -Computer Vision

Define CV, Know the history of CV and its advancement with AI, List tools and services for CV, Identify CV use cases, Define the main pipeline within a CV application, Understand how feature extraction works, Understand how image classification and recognition works, Define known techniques and classifiers that are used today for CV, Describe the IBM Watson Visual Recognition service, List the features available with Watson Visual Recognition, Describe the output provided by the Watson Visual Recognition service, Explain the capabilities of the default classifier, Explain the difference between a default and a custom classifier Describe how to train a custom classifier, Create a Watson Visual Recognition service and obtain the API key value, Use Visual Recognition API methods to: o Classify images, Detect faces in an image o Recognize text in an image, Create and train a custom classifier.

Learning Outcomes:

Having successfully completed this course, the student can:

1. Describe the field of AI and its subfields machine learning, NLP and computer vision
2. Describe the types of AI
3. List the factors that influenced the advancements of AI in recent years
4. List applications of AI
5. Explain what Machine Learning is.

Reference Book:

1. IBM COURSEWARE.

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Course Title**: DISTRIBUTED COMPUTING**	Course Code: **DA7010**
Credit: **3.5**	L T P **3 1 0**
Year: **4th**	Semester: **VII**

Unit I : **Fundamentals of Distributed Computing:** Introduction to distributed computing Systems, Resource sharing and the Web Challenges.
System Models: Architectural models, Fundamental Models
Theoretical Foundation for Distributed Computing System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks, Causal ordering of messages, global state, termination detection.

Unit II : **Distributed Mutual Exclusion**: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.
Distributed Deadlock Detection: system model, resource Vs communication deadlocks deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

Unit III : **Distributed Objects and Remote Invocation**: Communication between distributed objects, Remote procedure call, Events and notifications, Java RMI case study.
Distributed File Systems: File service architecture, Sun Network File System, The Andrew File System, Recent advances.

Unit IV : **Transactions and Concurrency Control**: Flat and nested distributed transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control.
Distributed Transactions: Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Atomic Commit protocols.

Unit V : **Introduction to Grid Computing:** Basics of grid Computing, Benefits of grid computing, Grid terms and concepts, Grid user roles, Standards for grid environments, Grid security requirements.
Introduction to Parallel Processing: Basic Concepts: Introduction to parallel processing, parallel processing terminology, Parallel & Distributed Programming: Parallel Programming environments

Text Book:

1. Tannenbaum, A, Van Steen. Distributed Systems, Principles and Paradigm , Prentice Hall India, 2002
2. Tannenbaum, A. Distributed Operating Systems, Pearson Education. 2006

Reference Book:

1. Attiya, Welch, "Distributed Computing", Wiley India, 2006
2. Singhal and Shivaratri, "Advanced Concepts in Operating Systems", McGraw Hill, 1994
3. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Ed.

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Batch: 2016-20

Course Title**: ADVANCED COMPUTER ARCHETECTURE**	Course Code: **DA7020**
Credit: **3.5**	L T P **3 1 0**
Year: **4th**	Semester: **VII**

UNIT 1 ***(6L)***

Introduction: Parallel Computing, Parallel Computer Model, Program and Network Properties, Parallel (Architectural Classification Schemes, Flynn's & Feng's Classification, Performance Metrics and Measures, Speedup Performance Laws: Multiprocessor System and Interconnection Networks; IEEE POSIX Threads: Creating and Exiting Threads, Simultaneous Execution of Threads, Thread Synchronization using Semaphore and Mutex, Canceling the Threads.

UNIT 2 ***(9L)***

Pipelining and Memory Hierarchy: Basic and Intermediate Concepts, Instruction Set Principle; ILP: Basics, Exploiting ILP, Limits on ILP; Linear and Nonlinear Pipeline Processors; Super Scalar and Super Pipeline Design; Memory Hierarchy Design: Advanced Optimization of Cache Performance, Memory Technology and Optimization, Cache Coherence and Synchronization Mechanisms.

UNIT 3 ***(8L)***

Thread and Process Level Parallel Architecture: Introduction to MIMD Architecture, Multithreaded Architectures, Distributed Memory MIMD Architectures, Shared Memory MIMD Architecture, Clustering, Instruction Level Data Parallel Architecture, SIMD Architecture, Fine Grained and Coarse Grained SIMD Architecture, Associative and Neural Architecture, Data Parallel Pipelined and Systolic Architectures, Vector Architectures.

UNIT 4 ***(8L)***

Parallel Computing model: Sequential model, need of alternative model, parallel computational models such as PRAM, LMCC, Hypercube, Cube Connected Cycle, Butterfly, Perfect Shuffle Computers, Tree model, Pyramid model, Fully Connected model, PRAM-CREW, EREW Models.

UNIT 5 ***(9L)***

Parallel Algorithms: PRAM Algorithms: Parallel Reduction, Prefix Sums, Preorder Tree Traversal, Merging two Sorted lists; Matrix Multiplication: Row Column Oriented Algorithms, Block Oriented Algorithms; Parallel Quicksort, Hyper Quicksort; Solving Linear Systems: Gaussian Elimination, Jacobi Algorithm; Parallel Algorithm Design Strategies.

Text Book:

1. Kai Hwang," Advance Computer Architecture", TMH
2. Matthew, "Beginning Linux Programming", SPD/WROX

Reference Book:

1. Hennessy and Patterson," Computer Architecture: A Quantitative Approach", Elsevier
2. Dezso and Sima, "Advanced Computer Architecture", Pearson
3. Quinn, "Parallel Computing: Theory & Practice", TMH
4. Quinn, "Parallel Programming in C with MPI and Open MP", TMH

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cloud Computing
Batch: 2016-20

Course Title**: CRYPTOGRAPHY AND NETWORK SECURITY**	Course Code: **DA7210**
Credit: **4**	L T P **3 0 2**
Year: **4th**	Semester: **VII**

Unit I : Introduction to security attacks, services and mechanism, introduction to cryptography.

Conventional Encryption: Conventional encryption model, classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography,stream and block ciphers.

Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard(DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES, confidentiality using conventional encryption, traffic confidentiality, key distribution

Unit II : Introduction to prime and relative prime numbers, finite field of the form GF(p), modular arithmetic, Fermat's and Euler's theorem, primarily testing, Euclid's Algorithm, Chinese Remainder theorem, Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffie-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elgamel encryption.

Unit III : **Message Authentication and Hash Function:** Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm(SHA).Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm.

Unit IV : **Authentication Applications:** Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), S/MIME.

Unit V : **IP Security:** Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

Web Security: Secure socket layer and transport layer security, secure electronic transaction (SET).

System Security: Intruders, Viruses and related threads, firewall design principals, trusted systems.

Text Book:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Prentice Hall, New Jersy.

Reference Book:

1. Johannes A. Buchmann, "Introduction to Cryptography", Springer-Verlag.
2. Bruce Schiener, "Applied Cryptography".

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cloud Computing
Batch: 2016-20

Course Title**: DATAWAREHOUSE & DATA MINING**	Course Code: **DA7030**		
	L	T	P
Credit: **3.5**	**3**	**1**	**0**
Year: **4th**	Semester: **VII**		

Unit I : Overview, Motivation (for Data Mining), Data Mining-Definition & Functionalities.

Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting. ROLAP, MOLAP, HOLAP.

Unit II : **Data Pre-Processing**: Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Inconsistent Data, Data Integration and Transformation.

Data Reduction: Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation.

Unit III : **Concept Description:** Definition, Data Generalization, Analytical Characterization,

Analysis of attribute relevance, Mining Class comparisions, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases

Unit IV : **Classification:** What is Classification, Issues regarding Classification, Decision tree, Bayesian Classification, Classification by Back propagation.

Unit V : **Cluster Analysis:** Data types in cluster analysis, Partitioning methods. Hierarchical Clustering- CURE and Chameleon, Density Based Methods-DBSCAN, OPTICS, Grid Based Methods- STING, CLIQUE, Outlier Analysis

Text Book:

1. Jiawei Han, Micheline Kamber, "Data Mining Concepts & Techniques" Elsevier

Reference Book:

1. M.H.Dunham,"Data Mining:Introductory and Advanced Topics" Pearson Education
   Mallach,"Data Warehousing System",McGraw –Hill

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cloud Computing
Batch: 2016-20

Course Title**: BUSINESS PROCESS MANAGEMENT**		Course Code: **DK7210**
Credit: **4**	L **3**	T **0**	P **2**
Year: **4th**		Semester: **VII**

Course Objective:

The Business Process Analyst career path prepares students to learn about managing upstream and downstream impacts and the cross-functional importance of processes to the overall objectives of an organization. It also explains important concepts such as process analysis, process improvement, macro design, Playback 0, and identifying and Working with key performance indicators (KPIs).

Unit 1 BUSINESS PROCESS OVERVIEW

Have a better understanding on how effective BPM impacts an entire business ecosystem, Apply BPM knowledge and its fundamentals in multiple business environments, Apply real-time business management, Understand process discovery, process optimization, and budget planning, List and describe the components of BPM, Define the importance of each BPM component, List the BPM essentials, Explain the BPM value proposition, Describe a process driven culture and how it differs from other organizational drivers, List the important factors that solidify a process driven culture in an organization, Explain the positive outcomes of a process driven culture, Identify and qualify BPM opportunities, Organize and prioritize BPM opportunities, List and describe a BPM project profile.

Unit 2: Introducing IBM Business Process Manager

Describe the challenges that face IT business process management development teams, List the strengths of Business Process Manager, List and describe the Business Process Manager configurations and product features, Explain how to use Business Process Manager to satisfy organizational needs, Describe the challenges that face IT business process management development teams, List the strengths of Business Process Manager, List and describe the Business Process Manager configurations and product features, Explain how to use Business Process Manager to satisfy organizational needs, Identify the correct application of the IBM Business Process Manager product to organizational needs, Describe the IBM Business Process Manager configurations, List the product features, Explain the Process Modeler components, Apply the proper configuration features to usage scenarios, Describe the Advanced configuration of Business Process Manager, List the product features of the Business Process Manager Advanced configuration, Explain the best use of Business Process Manager Advanced, Apply the proper configuration features to usage scenarios.

Unit 3: Process Discovery and Modeling in IBM Blueworks Live

Describe business process management (BPM) , List the components of a BPM project , List and describe BPM Project Team members, List and describe the Process Modeling phases, Describe how IBM Blueworks Live fits in Process Modeling, Create an IBM Blueworks Live Space and blueprint process, Capture process milestones for a Discovery Map, Capture process steps and activities for a Discovery Map, Create a sub process from Discovery Map activities, Capture important process details in a Discovery Map, Create a Discovery Map in an IBM Blueworks Live blueprint with a process narrative, Capture important process details in a Discovery Map, Document and collaborate on Discovery Map process details, Enhance a Process Diagram in a Blueworks Live blueprint, Examine the decision discovery, Describe the governance support with Blueworks Live, Conduct a Playback of the process

diagram in Blueworks Live, Create a process diagram from a Discovery Map, Modify the process diagram in an IBM Blueworks Live blueprint, Add elements to a process diagram based on a process narrative, Examine decision tasks with decision discovery, Conduct a Playback of the process diagram with business stakeholders in IBM Blueworks Live.

Unit 4: Process Modeling with IBM Business Process Manager

Define business process management (BPM), List and describe the phases in the BPM lifecycle procedure, Define process modeling, Describe Playback 0 and the achievements that are reached during this stage of project development, Describe how to use IBM Business Process Manager to accomplish process modeling, goals, Explain how to create and modify process applications in the Process Center, Explain how to create and modify process models with the Designer view of the web Process Designer, Describe how to validate process models with the Inspector view of the web Process Designer, Describe the purpose of the Process Portal, Describe the purpose and function of Blueworks Live, Describe the integration with other tools and products, Create a process application, Model a process, Describe pools and lanes, Start IBM Business Process Manager, Create a process application by using the web Process Designer, Create the foundation for a structured process by adding the appropriate lanes to the default pool, Create a process, Add ad hoc activities to the team lanes, Describe the purpose and function of Blueworks Live, List and describe the core notation elements that are used in IBM Process Designer, Examine a defined workflow from detailed process requirements and identify the interrelated process activities and the roles that are responsible for completing them, Decompose activities into processes and nested processes that contain process tasks, Create a process, nested process tasks, and responsible roles, Create a nested process, Create the foundation for a process by adding the appropriate lanes to the default pool, Translate business process workflow steps that are documented in the process discovery and analysis into process model tasks, Model the expected process flow for the initial process model, Decompose business process workflow steps that are documented in the process discovery and analysis into process model tasks , Create a sub process or a linked process, Describe process sequence flow and the runtime use of process tokens, List and describe gateways as they are used in web Process Designer, Explain how to evaluate conditions for a process gateway, Model gateways in a process, List and describe intermediate event types that are used in web Process Designer, Model a business process escalation path with an attached timer intermediate event, Add gateways to a process, Model the appropriate sequence flows for each gateway, Add a timer intermediate event to a process based on business requirements, Model an escalation path in a process with IBM Process Designer, Document details for the implementation team, Describe the Playback 0 validation goals and requirements, Validate that a process model meets Playback 0 goals and requirements, Validate that the business process reflects the intended requirements, Implement the requirements with Playback feedback and new process requirements as input.

Unit 5: Business Analysis for Agile BPM Process Transformation

Describe business process management (BPM) and its benefits to an organization , Describe the process transformation methodology, Identify common characteristics of a process-centric pattern, Describe process transformation roles and work streams, Create a macro design with Design Thinking, Describe agile principles and the Playback methodology, Describe BPM and how it can affect an organization, Describe and define BPM benefits, Apply change management tools to an organizations processes, Describe Blueworks Live and Business Process Model and Notation (BPMN), Generate and refine a detailed process diagram by using Blueworks Live, Advocate good practices for modeling in Blueworks Live, Use process documentation in Blueworks Live, Describe a use case for BPM with relevant current business process analysis, Identify case study process milestones and activities, Create a Blueworks Live

account, Apply process thinking, Define the components of a process-driven culture, Analyze a process by using the BPM methodology, Evaluate key inputs and outputs, Review known issues and impacts, Create the As-In process, Identify an organizations challenges, Document business requirements, Create the As-Is process model, Define key performance indicators (KPIs), Add value through process analysis, Create the To-Be process, Create the To-Be business process, Navigate the IBM Systems Solution Implementation Standard (ISSIS) portal to gather the type of material that is used for a process transformation project, Explore the ISSIS method library composition and terminology, Locate the IBM Business Process Manager collection of documentation, Maximize use of typical business analyst work products, templates, and deliverables, Conduct Playbacks • Navigate the hybrid cloud and process transformation, Advocate good practices for IBM Blue works Live, Set up a Business Process Center of Excellence with business analyst contributions, Create effective user stories, Use tools in ISSIS to help process analysis, Complete the user stories template for the To-Be process, Use BPM templates, Dissect Playback Zero, Prepare business analyst deliverables and the relationship with the BPM team members, Import a process into IBM Business Process Manager, Work with DevOps, Conduct Playback Zero.

Learning Outcomes:

Having successfully completed this course, the student can:

1. Describe and explain the Business Process Management (BPM) value proposition
2. Describe why process modeling is an important phase in the BPM lifecycle
3. Create structured and unstructured processes (formerly Case) by using the web Process Designer
4. Explain how to use Process Designer to create a process application V11.1
5. List and identify the core elements that are used to create a process in the web Process Designer

Reference Book:

1. IBM COURSEWARE.

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cloud Computing
Batch: 2016-20

Course Title**: BLOCKCHAIN**			Course Code: **DK8210**
Credit: **4**	L **3**	T **0**	P **2**
Year: **4th**			Semester: **VII**

Course Objective:

The BlockChain career path prepares students to apply BlockChain in real-life. This will require skills in businesses exchange value with suppliers, partners, customers and others. Exchange of value is a transaction. Blockchain for business provides a way to execute many more of these transactions—a much better way.

Unit 1 Blockchain Introduction:

To introduce the content, learning objectives, and learning outcomes, To remind students of pre-requisite knowledge and/or pre-work, To provide an introduction to BlockChain with emphasis on key concepts, To introduce use cases from different industries, An overview of BlockChain key concepts and their domain of application in different industries,

Applying BlockChain concepts: To apply key BlockChain concepts on a particular given use case, An exercise on applying BlockChain concepts on a selected use case to identify assets, participants, and transactions. The use case is for the sample application that is used for the rest of the lab exercises.

Unit 2: Understanding Hyper ledger Composer & BlockChain solution architecture

To introduce Hyperledger Composer, To introduce the Hyperledger Composer Playground GUI, An exercise

on using the Vehicle Manufacturing lifecylce project on Hyperledger Composer to implement the sample application and deploy it. Additionally, build a transaction and adding new participants.

Using Hyperledger Composer: To obtain hands-on knowledge of Hyperledger Composer including the Playground, An exercise on using Hyperledger Composer to implement the sample application and deploy it**., T**o understand the different components of Blockchain, To understand the architecture of a typical Blockchain solution, A closer look at Hyperledger Fabric and a typical Blockchain solution Architecture. Additionally, linkage to IoT and other technologies, **Exploring sample Blockchain application:** To deploy and explore a complete Blockchain sample and understand its different parts, To modify the artifacts of the sample (assets, participants, transactions), An exercise to explore the different parts of the sample application to highlight the different artifacts in design and runtime, Peer, certificate authority, ordering services, database, Docker image.

Unit 3: Blockchain deep dive

To understand network consensus, To understand Channels and Ordering Service, An explanation of how consensus works, how endorsements work, and ordering in the way Hyperledger Fabric operates, **Blockchain Composer Node.JS :** To modify and deploy the front-end application of the sample application, An exercise on developing and deploying a front end client application that consumes APIs exposed by Hyperledger Composer on the previous exercise, To understand business network setup, To understand Endorsement Policies, To understand pluggable world-state, A description of the elements of a business network, role of channels, and how world state is maintained, **Building Hyperledger Fabric business network :** To apply Hyperledger Fabric network concepts, A exercise on building a Hyperledger Fabric business network to deploy the sample application.

Unit 4: Understanding Hyperledger Fabric application development and blockchain deployment:

To introduce Hyperledger Fabric chaincode development, A closer look at chaincode development for Hyperledger Fabric,**Developing chaincode for Hyperledger Fabric :** To practice chaincode development for Hyperledger Fabric, An exercise on writing and deploying chaincode, To understand the different delivery options for Blockchain, A description of the different possible deployment options of Blockchain solutions including local, on IBM Container Service, and IBM Blockchain Platform, **Developing client app for Hyperledger Fabric:** To practice client app development for Hyperledger Fabric, An exercise on developing front end application for Hyperledger Fabric, and deploying the service, **Understanding Blockchain security:** To understand Hyperledger Fabric security including permissioned ledger access, To understand Hyperledger Composer security, A description of Hyperledger Composer and Hyperledger Fabric security.

Unit 5 : Securing a Blockchain application and integration options

To practice Hyperledger security concepts on the sample application, A description exercise on applying security concepts and access control to the sample application. The importance of GDPR, Learning Objectives:To understand the different integration options between Hyperledger and other systems, An exploration of the different integration options of Hyperledger Fabric, **Integrating Hyperledger with other systems:** To practice the integration topic with an example, An exercise on applying integration options to the sample application. Apply a node-red component on the front-end. Look at the REST APIs, triggering events, non-deterministic problems, etc…

Learning Outcomes:

Having successfully completed this course, the student can:

1. Blockchain Developer overview
2. What is Hyperledger Fabric
3. What is Hyperledger Composer
4. Simplifying BlockChain implementation
5. Applying BlockChain concepts
6. Hyperledger Composer capabilities

Reference Book:

1. IBM COURSEWARE.

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cloud Computing
Batch: 2016-20

Course Title**: ADVANCED RDBMS**	Course Code: **DK7250**
Credit: **4**	L T P **3 0 2**
Year: **4th**	Semester: **VII**

Unit I **(8 L)**

RDBMS: Entity –Relationship model – Relational Model – Relational constraints- Relational algebra ,Tuples and Domain Relational calculus, Database Administrator, Introduction to SQL, Data Definition Language, Data Manipulation Language, Data Control Language, Queries, Join, Functions, Operators, Invoking SQL *Plus, Commit, Rollback, Normal forms, ER Diagram, mapping.

Unit II **(8 L)**

Introduction to Pl/SQL, Control Statements, View, Indexes, Sequences, PL/SQL Cursor, Database Trigger, Function, Procedure, Exceptional Handling in Oracle 11i**.**

Unit III **(7 L)**

Query processing and optimization-Transactions-Properties of Transactions-Concurrency Control, Recovery, Security and Authorization, Storage-Indexing and Hashing, B+ Trees, Trees-X Trees, Dynamic Hashing .

Distributed Databases-Principles –Design-Queries Translation of queries optimization Access Strategies, Management of Distributed Transactions actions-concurrency Control-Reliability .

Unit IV **(7 L)**

Object Oriented Concepts-Data Object Models-Object Based Databases –Object Oriented Databases-Object Oriented Databases Relational Databases-Object Definition Languages-Object Query Languages-SQL3-Concurreency in OODBs-Storage and Access Data Access .

Unit V **(6 L)**

Other Database Models-Multimedia Databases-Parallel Databases Data Mining - Data Warehousing –Spatial Databases Concepts –Temporal Databases Concepts-Active Databases.

Text Book:

1. Fred R. McFadden, Jeffery A. Hoffer, Mary B. ,Modern Database Management, Prescott, Fifth Edition , Edition Wesley, 2000 .
2. Elmasri, Navathe, ,Fundamentals Of Database Systems, Third Edition,Addison Wesley, 2000 .
3. Abraham Silberchartz, Henry F. Korth, S. Sudarshan, Database System Concepts ,Third Edition, McGraw-Hill, 1996 .

Reference Book:

1. Jefry D. Ullman , Jenifer Widom ,A First Course in Database Systems, Pearson Education Asia, 2001 .
2. Stefano Ceri, Giuseppe Pelagatti, Distributed Databases Principles & Systems, McGraw-Hill International Editions, 1985
3. Rajesh Narang, Object Oriented Interfaces & Databases, Prentice Hall Of India, 2002 .

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cloud Computing
Batch: 2016-20

Course Title**: BUSINESS INTELLIGENCE**	Course Code: **DA8010**
Credit: **3.5**	L T P **3 1 0**
Year: **4th**	Semester: **VIII**

Unit I

Introduction to Business Intelligence,

Introduction to OLTP and OLAP, BI Definitions & Concepts, Business Applications of BI, BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities

Unit II

Basics of Data Integration (**E**xtraction **T**ransformation **L**oading)**,**

Concepts of data integration need and advantages of using data integration, introduction to common data integration approaches, introduction to ETL using SSIS, Introduction to data quality, data profiling concepts and application

Unit III

Introduction to Multi-Dimensional Data Modeling**,**

Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi dimensional modeling, concepts of dimensions, facts, cubes, attribute, hierarchies,

Unit IV

Star and snowflake schema, introduction to business metrics and KPIs, creating cubes using SSAS

Unit V

Basics of Enterprise Reporting**,**

Introduction to enterprise reporting, concepts of dashboards, balanced scorecards, introduction to SSRS Architecture, enterprise reporting using SSRS

Text Book:

1. David Loshin ,Business Intelligence.
2. Mike Biere ,Business intelligence for the enterprise .
3. Larissa Terpeluk Moss, Shaku Atre ,Business intelligence roadmap.

Reference Book:

1. Cindi Howson ,Successful Business Intelligence: Secrets to making Killer BI Applications .
2. Brain, Larson ,Delivering business intelligence with Microsoft SQL server 2008 .

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cloud Computing
Batch: 2016-20

Course Title**: REAL TIME SYSTEMS**	Course Code: **DA8040**
Credit: **3.5**	L T P **3 1 0**
Year: **4th**	Semester: **VIII**

UNIT-I: Introduction
Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

UNIT-II: Real Time Scheduling
Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III: Resources Access Control
Effect of Resource Contention and Resource Access Control (RAC), Nonpreemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

UNIT-IV: Real Time Communication
Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols

UNIT-V: Real Time Operating Systems and Databases
Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases

Text Book:

1. Jane W. S. Liu, "Real Time Systems", Pearson Education Publication.
2. Albert M. K. Cheng, "Real-Time Systems: Scheduling, Analysis, and Verification ,John Wiley and Sons Publications.

Reference Book:

1. Mall Rajib," Real Time Systems" Pearson Education

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cloud Computing
Batch: 2016-20

Course Title**: CYBER LAW & IPR**			Course Code: **DA8050**
Credit: **3**	L	T	P
	3	**0**	**0**
Year: **4th**			Semester: **VIII**

UNIT I - FUNDAMENTALS OF CYBER SECURITY

Introduction-Cyber Security and its problem-Intervention Strategies: Redundancy, Diversity and Autarchy.

UNIT II – ISSUES IN CYBER SECURITY

Private ordering solutions, Regulation and Jurisdiction for global Cyber security, Copy Right-source of risks, Pirates, Internet Infringement, Fair Use, postings, criminal liability, First Amendments, Data Loss.

UNIT III – INTELLECTUAL PROPERTY RIGHTS

Copy Right-Source of risks, Pirates, Internet Infringement, Fair Use, postings, Criminal Liability, First Amendments, Losing Data, Trademarks, Defamation, Privacy-Common Law Privacy, Constitutional law, Federal Statutes, Anonymity, Technology expanding privacy rights.

UNIT IV - PROCEDURAL ISSUES

Duty of Care, Criminal Liability, Procedural issues, Electronic Contracts & Digital Signatures, Misappropriation of information, Civil Rights, Tax, Evidence.

UNIT V-LEGAL ASPECTS OF CYBER SECURITY

Ethics, Legal Developments, Late 1990 to 2000,Cyber security in Society, Security in cyber laws case. studies, General law and Cyber Law-a Swift Analysis.

Text Book:

1. Jonathan Rosenoer,*"Cyber Law: The law of the Internet"*, Springer-Verlag,1997.

Reference Book:

1. Mark F Grady, Fransesco Parisi, "*The Law and Economics of Cyber Security"*, Cambridge University Press, 2006.

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cloud Computing
Batch: 2016-20

Course Title**: DIGITAL IMAGE PROCESSING**	Course Code: **DA7640**
Credit: **4**	L T P **3 0 2**
Year: **4th**	Semester: **VII**

Unit I : **Introduction and Fundamentals:** Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.
Image Enhancement in Spatial Domain: Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

Unit II : **Image Enhancement in Frequency Domain:** Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.
Image Restoration: A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

Unit III : **Color Image Processing:** Color Fundamentals, Color Models, Converting Colors to different models, Color Transformation, Smoothing and Sharpening, Color Segmentation.
Morphological Image Processing: Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening.

Unit IV : **Registration:** Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth
Segmentation: Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Regionbased Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

Unit V : **Feature Extraction:** Representation, Topological Attributes, Geometric Attributes.
Description: Boundary-based Description, Region-based Description, Relationship.
Object Recognition: Deterministic Methods, Clustering, Statistical Classification, Syntactic Recognition, Tree Search, Graph Matching.

Text Book:

Rafael C. Gonzalvez and Richard E.Woods., Digital Image Processing 2nd Edition, Pearson Education.
2. R.J. Schalkoff. ,Digital Image Processing and Computer Vision, John Wiley and Sons, NY.

Reference Book:

1. A.K. Jain. , Fundamentals of Digital Image Processing, Prentice Hall, Upper Saddle River, NJ.

Department of Computer Science & Engineering
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Batch: 2016-20

Course Title**: ADVANCED COMPUTER NETWORK**	Course Code: **DA7650**
Credit: **4**	L T P **3 0 2**
Year: **4th**	Semester: **VII**

UNIT I ***(8L)***

Network Design: Design Principles, Determining Requirements, Analysing the Existing Network, Preparing the Preliminary Design, Completing the Final Design Development, Deploying the Network, Monitoring and Redesigning, Maintaining, Design Documentation, Cisco PDIOO Model, Modular Network Design, Hierarchical Network Design, The Cisco Enterprise Composite Network Model.

UNIT II ***(8L)***

Router Design: Configuring a Router, Routing Protocols, **Switching Design**: Switching Types, Layer 2 and 3 Switching, Multilayer Switching, Cisco Express Forwarding, Switching Security, Multi-Protocol Label Switching (MPLS), MPLS Architecture and related protocols. **IPv4 Routing Design**: IPv4 Address Design, Private and Public Addresses ,NAT, Subnet Masks, Hierarchical IP Address Design, Deploying IPv6 in Campus Networks,

UNIT III ***(8L)***

Wireless LAN Design: Wireless Technology Overview, Wireless Standards, Wireless Components, Wireless Security, Wireless Security Issues, Wireless Threat Mitigation, Wireless Management, Wireless Design Considerations, IEEE 802.11, Wireless Standard, Cellular Networks, Mobile IP, Wireless Mesh Networks(WMNs), QoS Models: IntServ, DiffServ154, QoS Tools, Policing and Shaping, Congestion Avoidance, Congestion Management, Link- Specific Tools, QoS Design Guidelines.

UNIT IV ***(8L)***

Optical Networks: Benefits of Optical Networks, Optical Network Drivers, Component Applications, Design and Planning, Restoration, Network Management, WDM System, All-Optical Network, Optical Layer Services and Interfacing.

UNIT V ***(8L)***

Network Security and Management Design: Hacking: Vulnerabilities, Threats: Reconnaissance Attacks, Access Attacks, Information Disclosure Attacks, Denial of Service Attacks, Threat Defence Secure Communication, Network Security Best Practices, SAFE Campus Design.

ISO Network Management Standard: Protocols and Tools, SNMP, MIB, RMON, Cisco NetFlow, Syslog, Network Management Strategy: SLCs and SLAs, IP Service-Level Agreements, Content Networking Design.

Text Book:

1. Diane Tiare and Catherine Paquet, "Campus Network Design Fundamentals", Pearson Education, 2006.
2. Rajiv Ramaswami, Kumar N Sivarajan, Galen H Sasaki, "Optical Networks, A Practical Perspective", 3rd Edition, Elsevier, 2010.

Reference Book:

1. Craig Zacker, "The Complete Reference: Upgrading and Troubleshooting Networks", Tata McGraw-Hill, 2000.

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cloud Computing
Batch: 2016-20

Course Title: **STATISTICAL MACHINE LEARNING**			Course Code: **DA7670**
Credit: **4**	L	T	P
	3	**0**	**2**
Year: **4th**			Semester: **VII**

Unit I **Introduction:** Probability Theory, Overview of supervised learning, Curse of dimensionality, Decision theory, Information theory, Minimax theory, Parametric versus non-Parametric methods, Bayesian versus non-Bayesian approaches, Classification, Regression, Density estimation, Bias-variance, Lasso, MLE.

Unit II **Parametric and Nonparametric Methods:** Linear regression, Model selection, Generalized linear models, Classification, Structured prediction, Hidden Markov models; Regression: Linear smoothers, Variance estimations, Confidence bands, Average coverage, Space-scale smoothing, Multiple regression; Density estimation: Cross-validation, Histograms, Kernel density estimation, Local polynomials, Classification, Bootstrap and sub-sampling, Nonparametric Bayes.

Unit III **Kernel Methods and Machines:** Dual representations, Kernel construction, Selecting the width of the kernel, Kernel density estimation and classification, Radial basis functions and kernel, Gaussian processes, Maximum margin classifiers, Relevance vector machines.

Unit IV **Graphical and Mixture Models:** Bayesian networks: Generative models, Linear-Gaussian models; Conditional independence: D-separation; Markov random fields: Factorization properties, Relation to directed graphs; Inference in graphical models: Inference on a chain, Trees, Factor graphs, Sum-product & max-sum properties, Loopy belief propagation; K-means clustering, Mixtures of Gaussians, EM, An alternative view of EM.

Unit V **Other Learning Methods:** Unsupervised learning, Semi-supervised learning, Reinforcement learning, Ensemble learning, Online learning, Active learning.

Text Book

1. Bishop C. M., Pattern Recognition and Machine Learning, Springer (2006), 1st ed.
2. Hastie T., Tibshirani R., Friedman J., The Elements of Statistical Learning, Springer (2008), 2nd ed.

Reference Book

1. Wasserman L., All of Statistics: A Concise Course in Statistical Inference, Springer (2010), 1st ed.
2. Devroye L., Gyorfi L., Lugosi G., A Probabilistic Theory of Pattern Recognition, Springer, (1996), 1st ed.

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cloud Computing
Batch: 2016-20

Course Title**: COMPUTER VISION**	Course Code: **DA8630**
Credit: **3**	L T P **3 0 0**
Year: **4th**	Semester: **VIII**

Unit I

Introduction: What is computer vision, The Marr paradigm and scene reconstruction, Other paradigms for image analysis. Image Formation, Image Geometry, Radiometry, Digitization.

Unit II

Binary Image Analysis and Segmentation: Properties, Digital Geometry, Segmentation.

Unit III

Image Processing for Feature Detection and Image Synthesis, Edge detection, corner detection Line and curve detection, SIFT operator, Image-based modelling and rendering, Mosaics, snakes.

Unit IV

Stereo: Shape from shading, Photometric stereo, Texture, Occluding contour detection, Motion Analysis: Motion detection and optical flow Structure from motion

Unit V

Object recognition: Hough transforms and other simple object recognition methods, Shape correspondence and shape matching ,Principal component analysis ,Shape priors for recognition

Text Book:

1. D. Forsyth and J. Ponce, *Computer Vision - A modern approach*, Prentice Hall *Robot Vision*, by B. K. P. Horn, McGraw-Hill.

Reference Book:

1. E. Trucco and A. Verri ,*Introductory Techniques for 3D Computer Vision*, Publisher: Prentice Hall

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Batch: 2016-20

Course Title**: SOFTWARE TESTING**		Course Code: **DA8650**
Credit: **3**	L **3**	T **0**	P **0**
Year: **4th**		Semester: **VIII**

Unit I **(8 L)**

Introduction: Terminology, evolving nature of area, Errors, Faults and Failures, Correctness and reliability, Testing and debugging, Static and dynamic testing, Exhaustive testing: Theoretical foundations: impracticality of testing all data, impracticality of testing all paths, no absolute proof of correctness.

Unit II **(8 L)**

Software V & V Approaches and their Applicability: Software technical reviews; Testing techniques and their applicability -functional testing and analysis, structural testing and analysis, error-oriented testing and analysis, hybrid approaches, integration strategies, transaction flow analysis, stress analysis, failure analysis, concurrency analysis, performance analysis; Proof of correctness; simulation and prototyping; Requirement tracing.

Unit III **(8 L)**

Software Testing: Levels of Testing, Functional Testing, Structural Testing, Test Plan, Test Case Specification, Software Testing Strategies, Verification & Validation, Unit, Integration Testing, Top Down and Bottom Up Integration Testing, Regression and Stress Testing , Alpha & Beta Testing, White box and black box testing techniques, System Testing and Debugging.

Unit IV **(8 L)**

Test Generation: Test generations from requirements, Test generation pats, Data flow analysis, Finite State Machines models for flow analysis, Regular expressions based testing, Test Selection, Minimizations and Prioritization, Regression Testing.

Unit V **(8 L)**

Program Mutation Testing: Introduction, Mutation and mutants, Mutation operators, Equivalent mutants, Fault detection using mutants, Types of mutants, Mutation operators for C and Java.

Text Book:

1. Boris Beizer, Software Testing Techniques, John Wiley & Dreamtech (2002).
2. William Perry, Effective Methods for Software Testing, John Wiley & Sons, Inc. (2006) 3rd ed.
3. Aditya P. Mathur, Foundations of Software Testing, Pearson Education (2008).

Reference Book:

1. Glenford J. Myers, The Art of Software Testing, Wiley India Pvt. Ltd 2nd edition (2006) 2nd ed.
2. Roger S. Pressman, Software Engineering, A Practitioner's Approach, McGrawHill International Edition (2009) 7th edition.
3. Ian Sommerville, Software Engineering, Addison-Wesley Publishing Company, (2006) 8th ed.

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cloud Computing
Batch: 2016-20

Course Title: **MACHINE LEARNING & NEURAL NETWORKS**			Course Code: **DA8670**
Credit: **3**	L **3**	T **0**	P **0**
Year: **4th**			Semester: **VIII**

Unit I **Introduction:** Well-Posed learning problems, Basic concepts, Designing a learning system, Issues in machine learning. Types of machine learning: Learning associations, Supervised learning (Classification and Regression Trees, Support vector machines), Unsupervised learning (Clustering), Instance-based learning (K-nearest Neighbor, Locally weighted regression, Radial Basis Function), Reinforcement learning (Learning Task, Q-learning, Value function approximation, Temporal difference learning).

Unit II **Decision Tree Learning:** Decision tree representation, appropriate problems for decision tree learning, Univariate Trees (Classification and Regression), Multivariate Trees, Basic Decision Tree Learning algorithms, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

Unit III **Artificial Neural Network:** Perceptron learning, Pattern Classification. Hebb Rule. Adaline. Madaline. Delta Rule. Perceptron, Training a perceptron, Multilayer perceptron, Back propagation learning, Competitive learning, Hebbian learning, BAMs.

Unit IV **Supervised and Unsupervised learning**: Supervised and Unsupervised learning Reinforcement learning, Kohonen Self Organizing Maps, Adaptive Resonance Theory, Neural Network Applications. Recurrent Networks, Dynamically modifying network structure, .Support Vector Machines

Unit V **Inductive and Analytical Learning:** Learning rule sets, Comparison between inductive and analytical learning, Analytical learning with perfect domain theories: Prolog-EBG. Inductive-Analytical approaches to learning, Using prior knowledge to initialize hypothesis (KBANN Algorithm), to alter search objective (TangentProp and EBNN Algorithm), to augment search operators (FOCL Algorithm).

Text Book

1. Mitchell T.M., Machine Learning, McGraw Hill (1997) 2nd ed.
2. Alpaydin E., Introduction to Machine Learning, MIT Press (2010) 2nd ed.

Reference Book

1. 1. Bishop C., Pattern Recognition and Machine Learning, Springer-Verlag (2006) 2nd ed.

Department of Computer Science & Engineering

Detailed Syllabus for B.Tech. (CSE-CSF)

Batch: 2016-20

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Course Structure & Detailed Syllabus

of

B.Tech. in Computer Science & Engineering

Cyber Security & Forensics (IBM)

Batch 2016-20

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cyber Security & Forensics
Batch: 2016-20

Year: 1st **Semester: I**

Course Code	Course Title	L	T	P	Credits
JA1010	Engineering Mathematics-I	3	1	0	3.5
OA1210	Engineering Physics	3	1	2	4.5
LA1210	Essentials of Mechanical Engineering	3	1	2	4.5
HA1210	Professional Communication-I	3	0	1	3.5
DK1210	Software Foundation & Programming using C	3	0	2	4
BA1010	Environmental Science	2	0	0	2
LA1220	Engineering Graphics	1	0	0	1
HA1310	Soft Skills Development	0	0	2	1
	Total				**24**

Year: 1st **Semester: II**

Course Code	Course Title	L	T	P	Credits
JA2010	Engineering Mathematics-II	3	1	0	3.5
BA1210	Engineering Chemistry	3	1	2	4.5
EA1210	Introduction to Electrical Engineering	3	1	2	4.5
FA1210	Introduction to Electronics & Communication	3	1	2	4.5
HA2210	Professional Communication-II	3	0	1	3.5
DK2210	Software Foundation & Programming using C++	3	0	2	4
LA1110	Workshop Practice	0	0	2	1
	Total				**25.5**

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Year: 2nd **Semester: III**

Course Code	Course Name	L	T	P	Credits
DA3210	Data Structures	3	0	2	4
DA3220	Computer Based Numerical and Statistical Techniques	3	0	2	4
DK3210	Essentials of OOP using Java	3	0	2	4
DA3010	Discrete Mathematics	3	1	0	3.5
DA3020	Computer Organization	3	1	0	3.5
FA3221	Digital System Design	3	1	2	4.5
	Total				**23.5**

Year: 2nd **Semester: IV**

Course Code	Course Name	L	T	P	Credits
DA4010	Theory of Computation	3	1	0	3.5
FA52A0	Microprocessor	3	1	2	4.5
DA4210	Computer Networks	3	0	2	4
DA4220	Web Technology	3	0	2	4
DK4250	Information Management Basics (T3)	3	0	2	4
DA4242	Linux Administration & Shell Programming	3	0	2	4
DM4110	Industry Session on Emerging Technology in Information Security	0	0	2	1
DA4310	Value Addition Training	0	0	2	1
DA4410	Industrial Tour	0	0	2	1
	Total				**27**

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Year: 3rd **Semester: V**

Course Code	Course Name	L	T	P	Credits
JA5010	Probability & Random Variables	3	1	0	3.5
DA5020	Operating System	3	1	0	3.5
DA5210	Algorithms: Analysis & Design	3	0	2	4
DM5210	**Application Security**	**3**	**0**	**2**	**4**
DA5230	Artificial Intelligence	3	0	2	4
HA5010	Principles of Management	2	0	0	2
DA5310	Aptitude Building – I	0	0	2	1
	Total				**22**

Year: 3rd **Semester: VI**

Course Code	Course Name	L	T	P	Credits
DA6210	Computer Graphics	3	0	2	4
DA6220	Dot Net Technologies	3	0	2	4
DA6230	Compiler Design	3	0	2	4
DK6050	Essentials of Software Engineering (OOAD & SW Lifecycle) (T3)	3	0	0	3
GC5010	Engineering Economics	2	1	0	2
	Elective -I	3	0	0	3
DM6210	**Security Intelligence**	**3**	**0**	**2**	**4**
DA6310	Aptitude Building – II	0	0	2	1
DM6110	**Project-GRM**	**0**	**0**	**4**	**2**
	Total				**27**

After VI semester student will undergo minimum 6 weeks Industrial Training which will be evaluated in the VII semester.

List of Elective Subjects for VI Semester

Elective – I	
DA6640	Mobile Computing
DA6650	Data Base Administration

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Year: 4th **Semester: VII**

Course Code	Course Name	L	T	P	Credits
DA7010	Distributed Computing	3	1	0	3.5
DA7020	Advanced Computer Architecture	3	1	0	3.5
DA7210	Cryptography and Network Security	3	0	2	4
DA7030	Data Warehousing and Mining	3	1	0	3.5
DK8210	**Blockchain**	**3**	**0**	**2**	**4**
DL7210	**Predictive Analytics Modeler**	**3**	**0**	**2**	**4**
DA7510	Industrial Training and Presentation*	0	0	2	4
DK7250	Advanced RDBMS	3	0	2	4
DM7110	**Project-GRM**	**0**	**0**	**4**	**2**
	Total				**32.5**

List of Elective Subjects for VII Semester

Note: * The student shall undergo 'Industrial Training' during Summer Vacations and shall prepare the Report and Make a Presentation during this semester.

Year: 4th **Semester: VIII**

Course Code	Course Name	L	T	P	Credits
DA8010	Business Intelligence	3	1	0	3.5
DA8040	Real Time Systems	3	1	0	3.5
DA8050	Cyber Law & IPR	3	0	0	3
	Elective – III	3	0	0	3
	Elective -II	3	0	2	4
	Open Elective	3	0	0	3
DM8110	**Project-GRM**	**0**	**0**	**8**	**4**
	Total				**24**

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List of Elective Subjects for VIII Semester

Elective – II	
DA7640	Digital Image Processing
DA7650	Advanced Computer Networks
DA7670	Statistical Machine Learning
Elective – III	
DA8630	Computer Vision
DA8650	Software Testing
DA8670	Machine Learning & Neural Networks

List of Open Electives (To be conducted in VIII Semester)

Sl. No.	Branch	Subject Code	Name of Elective subjects
1	Physics	OA8710 OA8720	1. Nano Scale Science and Technology 2. Photonics Technology
2	EE	EA8710 EA8720	1. Non-Conventional Energy Resources 2. Instrumentation and Process control
3	ME	LA8710 LA8720	1. Entrepreneurship development 2. Quality Management
4	Civil	CA8710 CA8720	1. Environment and Ecology 2. GIS
5	CSE	**DA8740** DA8710	1. Management Information System (MIS) 2. Business Intelligence
6	IT	IA8730 IA8721	1. Internet of Things 2. IT In Business
7	ECE	FA8710	1. Consumer Electronics
8	Humanities	HA8710 HA8720	1. Industrial Psychology 2. Human Values and Ethics
9	MBA	GA8710 GA8730 GA8740	1. Organizational Behavior 2. Digital Marketing 3. Financial Modeling with Spread sheet

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Course Title: **Engineering Mathematics-I**			Course Code: **JA1010**
Credit: **3.5**	L **3**	T **1**	P **0**
Year: **1st**			Semester: **I**

UNIT I: Differential Calculus-I [**9**]

Functions of single variable: Limit continuity and differentiability; Indeterminate forms; Mean value theorems; Role's Theorem; Taylor's theorem with remainders; Curve tracing.

UNIT II: Differential Calculus-II [**9**]

Successive differentiation; Leibnitz theorem; Partial differentiation; Euler's theorem; Expansion of functions of several variables; Extrema of functions of several variables; Lagrange's method of multipliers.

UNIT III: Integral Calculus [**9**]

Improper integral-Beta and Gamma functions; Double and Triple integrals; change of order of integration; change of variables; Dirichlet's integral and its applications; Application of multiple integral.

UNIT IV: Vector Calculus

[**12**]

Vector Differentiation: Scalar and vector fields; gradient of scalar point function; directional derivatives; divergence and curl of vector point function; solenoidal and irrotational vectors.

Vector Integration: line, surface and volume integrals; Green's theorem; Stokes' theorem and Gauss divergence theorem (without proof).

Text Books:

- R. K. Jain & S. R. K. Iyenger, **Advanced Engineering Mathematics**, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.

Reference Books:

- E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, John &Wiley Sons, U.K., 2006.
- B. S. Grewal, **Higher Engineering Mathematics**, 42th Edition, Khanna publication, New Delhi, India, 2012.

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Batch: 2016-20

Course Title: **Engineering Physics**			Course Code: **OA1210**
Credit: **4.5**	L **3**	T **1**	P **2**
Year: **1st**			Semester: **I**

UNIT I:

Relativistic Mechanics: Inertial and Non-inertial Frames; Postulates of Special Theory of Relativity; Galilean and Lorentz Transformation; Length Contraction and Time Dilation; Addition of Velocities; Variation of Mass with Velocity and Mass Energy Equivalence.

UNIT II:

Interference: Introduction; Coherent Sources; Analytical treatment of interference; Young's double slit experiment and its analysis; Conditions of Interference; Fresnel's Biprism; fringes with white light; Determination of wavelength of monochromatic light by using Fresnel's Biprism method; Displacement of Fringes; Interference in plane parallel thin film (reflected and transmitted light) and wedge shaped film(reflected light only); Newton's Rings; Determination of wavelength of monochromatic light and determination of refractive index of a liquid by using Newton's ring method.

UNIT III:

Diffraction: Introduction; Difference between Interference and diffraction; resultant of superposition of n simple harmonic coherent vibrations; Fraunhofer diffraction due to single slit: resultant intensity; conditions of maxima; minima; angular and linear width of central maximum; Double slit diffraction: resultant intensity; missing order; N-slit diffraction : resultant intensity; conditions of maxima and minima; missing orders; angular width of principal maxima; Diffraction grating: formation of spectra and missing order spectra in spectrum; dispersive power of grating; Resolving power; Rayleigh Criterion of resolution; Resolving power of plane transmission diffraction grating.

UNIT IV:

Polarization: Polarised and unpolarised light and its pictorial representation; plane of polarisation and plane of vibration; Phenomenon of Double Refraction; positive and negative double refracting crystals; properties of ordinary and extra-ordinary Rays; Nicol Prism and its application as a polariser and analyser; Mathematical analysis of superposition of two linearly polarised light vectors; retardation plates – half wave plate and quarter wave plate; Production and detection of Plane; Circularly and Elliptically Polarized Light.

Laser: Spontaneous emission; stimulated emission and stimulated absorption; Einstein's A and B Coefficients and relation between them; Principle of Laser Action; Construction and Working of He-Ne; Semiconductor Laser.

UNIT V:

Wave Mechanics : Wave Particle Duality; de Broglie Concept of Matter Waves; Davisson and Germer experiment; Concept of wave packet; group and phase velocity; Heisenberg Uncertainty Principle and its applications viz. non existence of electron in nucleus; radius and energy of Bohr's first orbit; Schrödinger time independent and time dependent wave equation; Physical interpretation of wave function; Application of Schrodinger wave equation: Particle in a one dimensional box (eigen function and eigen values).

Introduction to Fibre Optics: Fundamental ideas about optical fiber; Types of fibers; Acceptance angle and cone; Numerical Aperture.

Text Books:

1. AjoyGhatak**; Optics;** Tata Mc-Graw Hill Education;2009.
2. Subramanyam; BrijLal;**A Text Book of Optics**; S. Chand, 2004.
3. K. Thyagarajan, AjoyGhatak; **Lasers: Fundamentals and Applications**; Second;Springer, 2010.
4. AjoyGhatak& K. Thyagarajan ;**Introduction to Fiber optics;**Cambridge University Press,1998.
5. Halliday, Resnick& Walker; **Principles of Physics**; Nineth, Wiley, India;2013

Reference Books:

1. Arthur Beiser ;**Concepts of Modern Physics**; Tata Mc-Graw Hill Education;2003.
2. Robert Resnick;**Introduction to Special theory of Relativity** ; First; John Wiley& Sons; 1968.
3. Jenkins and White ;**Fundamentals of Optics**; Fourth; McGraw-Hill;2001
4. David. J. Griffith; **An Introduction to Quantum Mechanics**;Second; Pearson prentice Hall; 2004.
5. Young and Freedman;**Sears and Zemansky's University Physics**,Tenth; Addison-Wesley, 2000.

List of Experiments

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help ofFresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locatethe position of cardinal points.
4. To determine the specific rotation of cane sugar solution using bi quartz polarimeter.
5. To determine the wavelength of spectral lines using plane transmissiongrating.
6. To determine the specific resistance of the material of given wire usingCarey Foster's bridge.
7. To determine the variation of magnetic field along the axis of a currentcarrying coil and then to estimate the radius of the coil.
8. To verify Stefan's Law by electrical method.
9. To calibrate the given ammeter using potentiometer.
10. To calibrate the give voltmeter using potentiometer.
11. To determine energy band gap of a given semiconductor material by p-n junction method.
12. To determine the viscosity of water by Poisseuille's method.

Note: Additional experiments may be added based on contents of syllabus.

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Batch: 2016-20

Course Title: **Essentials of Mechanical Engineering**			Course Code: **LA1210**
Credit: **4.5**	L **3**	T **1**	P **2**
Year: **1st**			Semester: **I**

UNIT – I **9L**

Introduction to Engineering: Difference between Science and Technology, history of wheel, introduction to prime movers, transmission system, belt, pulleys, gear system and nomenclature, braking system, Mechanism, lever mechanism, Working principle of power generation system, hydel power plant, thermal power plant and its main components.

Coplanar Force system: Resolution of force in two mutually perpendicular direction Free Body Diagram, Moment, Varignon's theorem, static equilibrium, Lami'sTheorem, type of joints/Support, Type of load: point load, uniformly constant and varying loads, beam and its type.

UNIT – 2 **7L**

Engineering material and their properties: Details of hook's law, Proportional limit, Yield point, Yield Stress, Engineering strain, Engineering stress, True stress and Strain, Plasticity, Elasticity, Allowable Strength, Hardness, Ductility, toughness, Fatigue, creep, strain energy, Impact Strength, Young modulus of Elasticity, Bulk Modulus, Poission Ration and its relation in between.

Stress and strain: Normal stress and strain, principle of Superposition, Deformation in stepped and composite bar.

UNIT – 3 **7L**

Thermodynamics: Macroscopic & microscopic study point of view, System, Surrounding and Universe, Phase, Property, State, Path, Process, Cyclic and non-cyclic processes, Quasi static process, Reversible and irreversible processes , Thermodynamic equilibrium, Concept of continuum, Energy and its forms, Enthalpy, Zeroth law, Different temperature scales and theory of temperature and Pressure measurement.

UNIT – 4 **8L**

Laws of Thermodynamics: Thermodynamic definition of work, Thermodynamic processes, Calculation of work in various processes and sign convention, Non-flow work and flow work, Joules' experiment, First law of thermodynamics, Internal energy and enthalpy, First law of thermodynamics applied to open systems, Steady flow energy equation and its applications, First law analysis for closed system (non flow processes), Limitations of first law of thermodynamics, PMM-I.

Statement of Second Law of Thermodynamics: Kelvin Planck's statement and Clausius statement and their equivalence.

UNIT – 5 **9L**

Power generation: Air standard cycle**,** IC Engine**,** Carnot cycle, Otto cycle, Diesel cycle, Important components of I.C.Engine, two stroke and four stoke engine, S.I. and C.I. engines, efficiency of Otto and diesel cycle

Basics of Heat Transfer: Concepts of the mechanisms of heat flows: conduction, convection and Radiation heat transfer application in engineering.

Reference Books:

1. Basu,A.R; A Text book of Engineering Mechanics(Applied Mechanics);2003 Edition; Dhanpat Rai & co.(p) Ltd, Delhi.
2. Chandramouli, P.N; Engineering Mechanics; Second Printing; PHI Learning Private Limited, Delhi; 2013.
3. Rajput, R. K; Material Science; S. K. Kataria & Sons, New Delhi.
4. Dubey, N. H; Engineering Mechanics, Statics and Dynamics; First reprint; McGraw Hill Education (India) Private Limited, New Delhi, 2013.
5. Ratan, S.S; Theory of machines; Second Edition; Tata McGraw Hill Publishing Company Limited, New Delhi.
6. Nag.P.K.; Engineering Thermodynamics; 3rd Edition; Tata McGraw Hill Publishing Company Limited, New Delhi.
7. Nag.P.K.; Heat and Mass Transfer; Tata McGraw Hill Publishing Company Limited, New Delhi.
8. Kumar.D.S; Basic of Mechanical Engineering; S. K. Kataria & Sons, New Delhi.

Essentials of Mechanical Engineering Lab

List of Experiments

1. Tensile test
2. Impact test
3. Hardness test
4. Pulley experiment
5. Experiment on conduction heat transfer
6. Demonstration of Impulse and reaction turbine
7. Study of 4s and 2S engine petrol Engine
8. Study of 4s and 2S engine Diesel Engine
9. Study of refrigerator and air conditioning

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Course Title: **Professional Communication – I**			Course Code: **HA1210**
Credit: **3.5**	L	T	P
	3	**1**	**0**
Year: **1st**			Semester: **I**

UNIT 1: **COMMUNICATION** **(6 Hrs)**

1. Communication: Definition and Process of Communication.
2. Types of Communication: Formal and Informal Communication, Verbal and Non-Verbal Communication.
3. Barriers to Communication: Intrapersonal and Interpersonal Barriers. Semantic Barriers, Physical Barriers, Psychological Barriers, and Organizational Barriers.

UNIT 2: **LISTENING SKILLS & SPEAKING SKILLS** **(8 Hrs)**

1. Importance and Objective of Listening Skills, Process of Listening, Listening and Hearing, Types of Listening, and Methods for Improving Listening Skills
2. Listening Comprehension: Identifying General and Specific Information.
3. Listening for Note taking and drawing Inferences.
4. Importance of Speaking Skills, Types of Speaking, Methods for Improving Speaking Skills
5. Introduction to Phonetic Transcription: Familiarization with British and American Usage.

UNIT 3: **READING SKILLS** **(4 Hrs)**

1. Importance of Reading Skills, Types of Reading Skills, Methods of Improving Reading Skills.
2. Vocabulary Building: Antonyms, Synonyms, Homophones, Homonyms, and One-Word Substitution, Etymology and roots.

UNIT 4: **WRITING SKILLS** **(10 Hrs)**

1. Importance of Writing Skills, Types of Writing Skills, and Methods for Improving Writing Skills.
2. Sentence and Paragraph Construction. Writing Expository, Argumentative and Deductive Order etc Paragraphs.
3. Précis Writing
4. Basic Letter Writing: Format and Style of Formal Letters.

UNIT 5: **ONE ACT PLAY** **(6 Hrs)**

Practice of LRSW through the study of the one act play, ***THE REFUND*** by **Fritz Karinthy**.

TEXT BOOK

1. Gupta, Ruby. Basic Technical Communication, Cambridge University Press, New Delhi.2012.

REFERENCE BOOKS

1. Rizvi, Ashraf. Effective Technical Communication, McGraw Hill, New Delhi. 2005
2. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011
3. Tyagi, Kavita& Padma Misra. Basic Technical Communication, PHI, New Delhi. 2011
4. Lewis, Norman. Word Power Made Easy, W.R Goyal Pub. & Distributors.1995
5. Ford A, Ruther. Basic Communication Skills; Pearson Education, New Delhi.2013
6. Aslam, Mohammad. Introduction of English Phonetics and Phonology Cambridge.2003
7. Kameswari, Y. Successful Career Soft Skills and Business English, BS Publications, Hyderabad.2010
8. English Pronouncing Dictionary, Cambridge.2012
9. The Oxford Guide to Writing and Speaking. OUP, Delhi.2011

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Professional Communication – I Lab

Lab 1	Neutralization of Mother Tongue Influence through manner of articulation
Lab 2	Common Errors in English and Indianisms.
Lab 3	Introduction to Speech Sounds – Practicing Vowel and Consonant sounds
Lab 4	Syllable, word stress, Sentence stress
Lab 5	Pause group, Intonation & Rhythm
Lab 6	Functional English
Lab 7 & 8	Everyday Conversation : Greetings, Apologies, Requests, At a Restaurant, Shopping, Groceries, Hiring an Apartment, Travel Courses, etc.
Lab 9	Developing Listening skills through cultural movies
Lab 10 &11	Movie - To provide exposure to the target language
Lab 12	Final evaluation based on Extempore

References: (Software and Videos)

1. Wordsworth English Language laboratory software
2. Wordsworth Prep 1-2-3
3. Connected Speech Level 1-2-3
4. Learn To speak English CD 1-2-3-

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Batch: 2016-20

Course Name	**IBM CE - Software Foundation Course with C Programming**
Course Code	RATSWF3BIN / **DK1210**
About Technology	Software is the invisible thread that exists today in all systems that we see or experience, be it while travelling, shopping, banking, connecting with friends or performing any other routine task. Software not only integrates information, empowers people, connects global ecosystems, and optimizes business processes but, also brings business, people, and the world together. The open source technologies and concepts form the conceptual foundation of current day software development platforms.
About Course	This course provides conceptual and foundational knowledge of the Fundamentals of technologies in the context of software and programming. The contents of this course will ensure a student's interest in the subject is well founded and sows a seed for a conceptual understanding of History of Computing, including programming and the Open Source concepts. The course includes enough hands on exercises for the students to be glued on to it.
Target Audience	The Software Foundation course enables students in early stages of undergraduate studies who want to make a career in Information Technology industry. Students of: – CS/IT/ECE/EEE Engineering - 1st / 2nd Year – BCA/ BSC – 1st / 2nd year
Pre-requisites	No previous Software knowledge, other than basic computer/Windows usage required.
Contents	Brief History of Computing Art and Science of Programming Introduction to C Programming - Background of C - Getting Started with C - Constructs, Loops & Arrays - Functions - Pointers - User Defined Types - Binary I/O With Structures - Appendix. Reference Tables Open Standards, Open Source, and IBM - What is an Open Standard - Open Standards Model - Industries needing standards - The Impact of Standards - Open Source Software - Open Source - Open Source Technology - The OPEN Proposition Introduction to Linux - What is Linux - Background of Linux - Why is Linux so popular - What can you do with Linux - Linux Distributions - Linux Technology Center - Future of Linux PHP - What is PHP - PHP – Key Driver of LAMP Stack

- Getting Started with PHP
- Unified ODBC
- PHP Data Objects
- PHP Deployment Platform
- What is Zend Core
- Features and Benefits
- Zend and IBM
- What is Ruby
- What is Rails

Applicable Prometric Certification - NA -

Follow on courses

- IBM CE - Software Foundation (Advanced) Course with C++ Programming
- IBM CE Minor Projects
- IBM CE – Introduction to Object -Oriented Programming using Java
- IBM CE - Basics of Information Management with DB2
- IBM CE - Basics of IBM Rational Rhapsody
- IBM CE - Introduction to Cloud Computing

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Course Title: **Environmental Science**			Course Code: **BA1010**
Credit: **2**	L **2**	T **0**	P **0**
Year: **1st**			Semester: **I**

Unit – 1

(6L)

Natural Resources: Renewable and non-renewable resources

Definition, scope, importance and need for public awareness, natural resources and associated problems.

- Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
- Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
- Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture and green revolution, water logging, salinity.
- Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources.
- Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Unit – 2

(5L)

Ecosystems

Concept, Structure and function of an ecosystem, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the Forest and aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit – 3

(5L)

Biodiversity and its conservation

Introduction – Definition: genetic, species and ecosystem diversity. Bio geographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-sports of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit – 4

(6L)

Environmental Pollution

Definition, Cause, effects and control measures of:-

a. Air pollution b. Water pollution c. Soil pollution

d. Marine pollution e. Noise pollution f. Thermal pollution
g. Nuclear hazards

• Solid waste Management and biomedical waste: Causes, effects and control
• Role of an individual in prevention of pollution.
• Pollution effects-global warming, acid rain, ozone depletion, smog and case studies.
• Disaster management: floods, earthquake, cyclone and landslides.

Unit – 5

(6L)

Social Issues and the Environment

• From Unsustainable to Sustainable development
• Water conservation, rain water harvesting, watershed management
• Environmental Impact Assessment and Resettlement and rehabilitation problems.
• Climate change
• Wetland conservation.
• Role of remote sensing and GIS in environmental monitoring and analysis
• Environment Protection Act. 1986
• Air (Prevention and Control of Pollution) Act. 1981
• Water (Prevention and control of Pollution) Act 1974
• Wildlife Protection Act 1972
• Forest Conservation Act 1980.

Field work:

• Visit to a local area to document environmental assets river/forest/grassland/hill/mountain
• Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
• Study of common plants, insects, birds.
• Study of simple ecosystems-pond, river, hill slopes, etc.

REFERENCE BOOKS:

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad –380 013, India, Email:mapin@icenet.net (R)
2. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
3. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
4. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
5. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
6. Gleick, H.P. 1993. Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
7. Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
8. Mckinney, M.L. & School, R.M. 1996. Environmental Science Systems & Solutions, Web enhanced edition. 639p.
9. AnubhaKaushik&Kaushik, C.P. 2009.Perspectives in Environmental Studies, New Age International Publishers.
10. Manahan. S.E., Environmental chemistry, 9th edition.

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Course Title: **Engineering Graphics**			Course Code: **LA1220**
Credit: 1	L **1**	T **0**	P **0**
Year: **1st**			Semester: **I**

UNIT – 1
Introduction: Sheet Layout, Types of Sheet, Size of Sheets, Title blocks, Type of lines, Lettering, Dimensioning, Scale (Full, Reduced, Large) Geometrical Constructions,
UNIT – 2
Projection: Methods of Projection, Planes of Projection, Projection of points, Projection of straight lines, Projection of auxiliary planes, Projection of planes.
UNIT – 3
Projection of solids, Sections of solids.
UNIT – 4
Development of surfaces
UNIT – 5
Isometric Projections

Reference Books:
1) Bhatt N. D. & Panchal V. M, "Engineering Drawing", Charotar Publisher, 2007.
2) Dhanjay A Jolhe, "Engineering Drawing" Tata McGraw Hill, 2008.
3) Gill P.S "Engineering Graphics" S. K. Kataria & Sons, 2009
4) John K.C, "Engineering Graphics" , 2nd edition, PHI Learning Pvt. Ltd., 2010

List of Experiments

1. Introduction to AutoCAD Commands, Explaining need of AUTO CAD over Manual drafting, Simple Drawings.
2. Sheet on Lettering and Geometric construction.
3. Orthographic Projections, Basic problem based on Projection of points.
4. Sheet on Projection of Lines.
5. Sheet on Projection of Planes.
6. Sheet on Projection of Auxiliary Planes.
7. Sheet on Projection of Solids.
8. Development of Surfaces.
9. Sheet on Isometric Projections from orthogonal views.

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Course Title: **Engineering Mathematics – II**			Course Code: **JA2010**
Credit: **3.5**	L **3**	T **1**	P **0**
Year: **1st**			Semester: **II**

UNIT I: **(10L)**

Linear Algebra

Matrices; Inverse of matrix; Echelon form; Rank of matrix; Consistency and solution of a system of linear equations; Linear dependence and independence of vectors; Matrix transformations; Eigen values and eigenvectors; Cayley– Hamilton theorem; Reduction to diagonal form; Vector spaces; Sub spaces; Basis; Dimension; Linear Transformation**.**

UNIT II: **(8L)**

Differential Equations

Linear differential equations first order and first degree; Linear differential Equations of higher orders with constant coefficients; Complementary functions and Particular integrals; Euler-Cauchy linear differential equations; Simultaneous linear differential equations; Method of variation of parameters.

UNIT III: **(6L)**

Infinite Series

Introduction; Sequences; Series; Convergence; Series of positive terms; Comparison test; Integral test; D'Alembert's Ratio test; Cauchy's root test; Alternating series; Leibnitz rule.

UNIT IV: **(8L)**

Fourier Series

Periodic functions; Fourier series of Periodic functions; Euler's formulae; Functions having arbitrary period; Change of intervals; Even and Odd functions; Half range sine and cosine series.

UNIT V: **(8L)**

Laplace Transform

Laplace Transform; Existence theorem; Properties of Laplace Transform ; Laplace Transform of derivatives and integrals; Laplace Transform of Periodic functions; Unit Step function and Error Function; Dirac- Delta function; Unit impulse function; Convolution theorem; Applications of Laplace Transform to solve linear and simultaneous differential equations.

Text Books:

1. R. K. Jain & S. R. K. Iyenger, **Advanced Engineering Mathematics**, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.
2. E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, John Wiley & Sons, U.K., 2006.

Reference Books:

1. W. E. Boyce and R. Di Prima, **Elementary Differential Equations**, (8th Edition), John Wiley & Sons, U.K., (2005).
2. B. S. Grewal, **Higher Engineering Mathematics**, 42nd Edition, Khanna Publication, New Delhi, India, 2012.

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Course Title: **Engineering Chemistry**			Course Code: **BA1210**
Credit: **4.5**	L **3**	T **1**	P **2**
Year: **1st**			Semester: **II**

UNIT – I

Water Chemistry

Introduction, Analysis of Water – Alkalinity, Chlorides and Dissolved Oxygen, Hardness of Water - Temporary and Permanent hardness, Estimation of hardness by EDTA Method, Disadvantages of Hard Water, Numerical problems.

Water for Industrial purpose – Boiler Feed Water, Boiler Troubles (Priming and Foaming, Boiler Corrosion, Scales and Sludges, Caustic Embrittlement), Water Treatment: Internal Treatment (Colloidal, Phosphate, Calgon, Carbonate Conditioning), External Treatment (Lime-Soda Process, Zeolite Process, Ion- Exchange Process), Numerical Problems.

UNIT – II

Physical Chemistry

Electrochemistry: Reference electrodes, Ion selective electrodes, Chemically modified electrodes as sensors, Electrochemical energy systems, Lithium batteries, Fuel cells.

Thermochemistry: Hess's Law, Heat of a reaction, Effect of temperature on heat of reaction at constant pressure (Kirchoff's eq.), Heat of dilution, Heat of hydration, Heat of neutralization and Heat of combustion.

Surface chemistry: Surface and interfacial tension, Capillary pressure.Adsorption phenonmenon, Adsorption of gaseson solids, Frendlich and Langmuir adsorption isotherms,Role of adsorbents in catalysis, ion-exchange and pollution abatement.

UNIT – III

Science of Corrosion and Protective Coatings

Introduction, Types of Corrosion, Theories of Corrosion and Mechanism, Factors Influencing Corrosion.Control of Corrosion.

Types of Protective Coatings: Metallic Coatings, Anodic Coatings, Galvanization, Cathodic Coatings, Tinning, Metal Cladding, Electroplating (Chromium Plating, Metal Spraying, Cementation-Sheradizing, Colourizing, Chromizing).

UNIT – IV

Introduction to Polymers and Nano-materials

Polymerization, Classification of polymers, Addition and Condensation Polymerizations. Plastics - Thermosetting and Thermoplastics. Preparation, Properties and Uses of Polyethylene, PVC, Teflon, Bakelite, Nylon, Polyester, Polyurethane, Ziegler-Natta catalyst, conducting polymers.Rubber-Processing of Natural Rubber, Vulcanization and Compounding. Elastomers: Buna-S, Buna- N, Thiokol.

Introduction to Nano-materials: Fullerenes, Nano-tubes, Nano-wires, Nano-cones, Nano-dots, Nano-sphere, Haeckelites. Their electronic and mechanical properties, Production methods for CNTs. Applications of nano materials in i) Medicine ii) Catalysis iii) Environmental Technologies iv) Electronics& related fields. v) Mechanics.

UNIT – V

Fuels & Lubricants

Fuels: Classification, crude oil: composition and fractionation, Octane & Cetane Number and their significance; calorific value of fuel, Determination of calorific value of fuels, bomb calorimeter, Solid fuels - Proximate and ultimate analysis, Numericals problems.

Lubricants: Functions of lubricants, Mechanism of Lubrication (thick film or hydrodynamic lubrication, thin film or boundary lubrication, extreme pressure lubrication), Classification and properties of lubricants-Viscosity, Flash and fire point, Cloud and pour point, Aniline point, Neutralization number and mechanical strength. Numerical problems on acid value and saponification value.

Text Books:

1. Chemistry in Engineering & Technology (Vol I & II) (Latest ed.) By J.C. Kuriacose& J. Rajaraman, Tata McGraw-Hill Co, New Delhi.
2. Engineering Chemistry by O.G. Palanna, Tata McGraw-Hill Co, New Delhi.

Reference Books:

1. Atkins' Physical Chemistry by Peter W. Atkins and Julio de Paula, Oxford University Press.
2. Principles of Physical Chemistry (Latest ed.) By Puri, Sharma & Pathania.
3. Organic chemistry, Morrison and Boyd, Pearson Prentice Hall, 2011
4. Environmental chemistry, S.E. Manahan, 9th edition, CRC Press.
5. Textbook of polymer science by F.W. Billmeyer, Wiley India.

Engineering Chemistry Lab

List of Experiments

1. Estimation of hardness of water by EDTA method
2. Estimation of total alkalinity in the given water sample.
3. Estimation of dissolved oxygen in the given water sample.
4. Estimation of available chlorine in the given sample of bleaching powder.
5. pH-metric titration.
6. Determination of viscosity of lubricants by Redwood viscometer / Ostwald's viscometer.
7. Determination Surface Tension of lubricants.
8. Determination of Flash point of a given oil by Pensky_Marten's flash point approach.
9. To Determine Saponification-value of the given Lubricating Oil.
10. To Determine Acid-Value of the given Lubricating Oil.
11. To determine the moisture, volatile and ash contents in a given coal sample by proximate analysis.
12. To study the adsorption of acetic acid on activated charcoal.

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Course Title: **Introduction to Electrical Engineering**			Course Code: **EA1210**
Credit: **4.5**	L **3**	T **1**	P **2**
Year: **1st**			Semester: **II**

UNIT – 1
D.C. NETWORK THEORY
Review of basic circuit theory concepts, Mesh and Nodal analysis, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Star–delta transformation, Magnetic Circuits.

UNIT – 2
A.C. CIRCUITS & MEASURING INSTRUMENTS
*Single Phase A.C.:*Phasor representation of voltage and current, A.C. circuit behavior of resistance, inductance, capacitance & their combination in series and parallel, Power triangle, Power factor, Concept of series & parallel resonance.
*Three Phase A.C.:*Star – delta connections, Relation between line and phase quantities, three phase power and its measurement, What is 3 phase 4 wire and 3 phase 5 wire system?
Measuring Instruments: Construction and principle of voltage and current measuring instruments.

UNIT – 3
TRANSFORMERS
Principle of operation, Types of construction, Phasor diagram, Equivalent circuit, Efficiency and voltage regulation of single phase transformer, O.C. and S.C. tests.

UNIT – 4
D.C. & SYNCHRONOUS MACHINES
D.C. Machines: Construction and working principle of d.c. generator and d.c. motor, Types of d.c. machines, E.M.F. equation, Torque equation, Magnetization and load characteristics, Losses and efficiency, Need of starter in d.c. motors.
Synchronous Machines: Construction and Principle of operation of Alternator and Synchronous Motor.

UNIT – 5
INDUCTION MOTORS
Three Phase Induction Motors: Principle of operation of 3-Ø induction motor, Types of 3-Ø induction motor, Need of starters in 3-Ø induction motors, Slip – torque characteristics,
Single Phase Induction Motor: Principle of operation of single phase induction motor, Methods of starting of single phase induction motor.

Reference Books:
1. V. Del Toro. " Principles of electrical Engineering, "Prentice hall International.
2. W.H. Hayt& J.E. Kemmerly," Engineering circuit Analysis, "McGraw Hill.
3. I. J. Nagrath, "Basic Electrical Engineering," Tata Mc. Graw Hill.
4. A. E. Fitgerald, D.E., Higginbotham and A Grabel, "Basic Electrical Engineering" McGraw Hill
5. H. Cotton, "Advanced Electrical Technology" Wheeler Publishing.

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Basic Electrical Engineering Lab

(Any Ten)

1. Verification of Network Theorems.
2. Study of diode characteristics. Study of phenomenon of resonance in RLC series circuit.
3. Measurement of power in a three phase circuit by two wattmeter method.
4. Measurement of efficiency of a single phase transformer by load test.
5. Determination of parameters and losses in a single phase transformer by OC and SC test.
6. Study of characteristic of DC Motor.
7. Study of characteristic of AC Motor.
8. DC generator characteristics.
9. 10. Speed control of dc shunt motor.
10. Study running and reversing of a three phase induction motor.
11. Study of a single phase energy meter.

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Course Title: **Introduction to Electronics & Communication**			Course Code: **FA1210**
Credit: **4.5**	L **3**	T **1**	P **2**
Year: **1st**			Semester: **II**

UNIT 1: Fundamental of Semiconductors ***10 L***

Energy bands in semiconductors, intrinsic and extrinsic semiconductors, Fermi Level in Intrinsic and Extrinsic semiconductor, Carrier transport in semiconductors: diffusion current, drift current, mobility, Hall Effect and resistivity. Generation and recombination of carriers.

UNIT 2: Application of Low Power and High Power Diodes ***10 L***

Diode circuits: Construction, Junction diode characteristics, Half and full wave rectifiers - Expression for efficiency and ripple factor - Bridge rectifier – π Filter circuits, Clipper, Clamper and multipliers using diodes, Zener Diode Characteristics - Regulated power supply using Zener diode.

UNIT 3: Transistor fundamentals ***8 L***

Transistor circuits: Characteristics of a transistor in CB, CE and CC modes - Relatively merits - Biasing of Transistors - Load Line and operating point concept (both AC and DC). Construction and working of JFET and MOSFET.

UNIT 4: Digital fundamentals and Introduction to Signals ***8 L***

Basic logic gates: AND, OR, and NOT – implementation of all gates using Universal gates, Number Systems conversions, Boolean algebra, K-map (upto 4 variables). Source of Information, Types of Signals.

UNIT 5: Basics of Communications & Instrumentation ***9 L***

*C*ommunication Systems, Communication Channels, Need of modulation, Types of modulations (Wave shapes and final expression only), Study of Piezoelectric, PMMC, LVDT and Strain Gauge transducers and their classifications and display device (7 segment) only.

Reference Books:

Unit 1. Electronics Devices and Circuits, Millman and Halkias, Tata McGraw Hill, 4th ed.
Unit 2 & 3. Electronic Devices and Circuit Theory, Robert L. Boylestad, Prentice Hall Higher Edu., 2000.
Unit 4. Digital Design, Morris Mano, PHI
Unit 4. Modern Digital & Analog Communications, B. P. Lathi, OUP
Unit 5. Electronic Communication Systems, John Kennedy , Tata McGraw Hill, 4th ed.
Unit 5. Electronic Instrumentation - H. S. Kalsi

ELECTRONICS ENGINEERING LAB.

1. To identify and Study of the various component and Devices of electronics with their specification (CRO, Function Generator, Multimeter, Power Supply, resistor, capacitor, inductor, ICs, LED, potentiometer etc.)
2. To study the V-I characteristics of PN diode and Zener diode.
3. To find the efficiency of Rectifiers and ripple factor of capacitive and non-capacitive half wave and full wave rectifier.
4. To Study and Verify clipper and clamper with biased circuits.
5. To find the characteristics of CB and CE amplifiers.
6. Determine the characteristics of FET.
7. To find out the power energy of various periodic and non periodic signals.
8. To verify the logic gates using diodes.
9. Study and observations of AM & FM Waveforms.
10. Study of various transducers (Strain Gauge).

***** *Plus 2-3 value added experiments can be performed.*

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Course Title: **Professional Communication – II**			Course Code: **HA2210**
Credit: **3.5**	L **3**	T **0**	P **1**
Year: **1st**			Semester: **II**

UNIT 1: **PROFESSIONAL COMMUNICATION** **(6 Hrs)**

1. Importance and Features of Business Communication, Flow and Channels of Communication in an Organization.
2. Introduction to Technical Communication, Types and History of Technical Communication.
3. Difference between General and Technical Communication, and Importance of Technical Communication.
4. Characteristic of Technical Communication, and Elements of Style.
5. Process of Preparing a Technical Document.
6. Elements and Features of Scientific Articles.
7. Compunication, E- mail, E- tools and Encyclopedia.

UNIT 2: **BUSINESS CORRESPONDENCE** **(8 Hrs)**

1. Business Correspondence – Principles, Features, Types, Format and Layout of Business Letter.
2. Inter Office Correspondence – Letters of Enquiry, Quotation, Order, Sales, and Complaint.
3. Intra Office Correspondence: Notice, Agenda, Minutes, and Memorandum.
4. Job Application Letter.

UNIT 3: **TECHNICAL PROPOSAL and TECHNICAL REPORT** **(8 Hrs)**

1. Technical Proposal - Introduction, Purpose, Features, Types, Format, Importance, and Writing Technical Proposals and Plagiarism.
2. Technical Report - Features, Types, Style, Format, Relevance, and Writing Technical Reports.

UNIT 4: CORPORATE COMMUNICATION SKILLS **(8 Hrs)**

1. Dimensions and importance of EQ
2. Interpersonal communication skills - Life Position, and Transactional Analysis
3. Johari Window: Role of Feedback and Disclosure in Communication; Accepting Criticism
4. Cross Cultural Communication
5. Attitude
6. Perception
7. Personality Attributes and Communication: Self Esteem, Self-Monitoring, Impression Management, and Locus of Control.
8. Conflict and Negotiation

UNIT 5: PROJECT **(6 Hrs)**

REPORT WRITING/ PROPOSAL WRITING

The students will write a Report **OR** a Proposal consisting of 10-15 pages.

REPORT WRITING

1. **For B.Tech. students**-
    a. Technical Report describing new machinery, a report on the sudden break down in production unit, and market survey report for formulating new market strategy.
2. **For B.Pharma. students**
    a. Technical Report based on the site inspection of a drug manufacturing unit, Survey Report on Health Awareness and Self-Medication.
3. **For B.Arch. students**

a. Technical Reports based on a Site Inspection for Geographical and Geological aspects of a particular location, A Report on the Architectural Survey of a Monument. Architectural

PROPOSAL WRITING

1. **For B.Tech. students**
   a. Technical Proposal to organize a Technical Training Program, To develop new range of a product and to start a new venture.
2. **For B.Pharma. students**
   a. Technical proposal to establish a new laboratory, To create new drug-composition and to visit to a Super Specialty Hospital.
3. **For B.Arch. students**
   a. Technical Proposal for an Archeological Site visit , To Construct New Buildings.

Report Writing and Proposal Writing carries 30 marks equivalent to three class tests.

TEXT BOOK

1. Gupta, Ruby. Advanced Technical Communication, Cambridge University Press, New Delhi. 2011.

SUGGESTED REFERENCE BOOKS

1. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011.
2. Tyagi, Kavita& Padma Misra. Advance Technical Communication, PHI, New Delhi.2011
3. Technical Communication, Cengage Learning, New Delhi.2010
4. Technical Communication, OUP, New Delhi. 2013
5. Wallace, Masters Personality Development, Cengage Learning, New Delhi.2006
6. Barrass, Robert: Students Must Write, Foundation books, Cambridge, New Delhi.2006
7. Rao, Bhaskar: Successful Career Soft Skills and Business English, BS Publications, Hyderabad.2012
8. Chakrawarthi: Soft Skills for Professionals, Wiley India.2011

Professional Communication – II Lab

Lab 1	Vocabulary Building
Lab 2	Telephone Etiquette: Making an appointment , answering Calls
Lab 3	Public Speaking
Lab 4	Group Discussion: Do's and Don'ts of GD
Lab 5 & 6	Interview Skills: Preparation
Lab 7	PP Presentation Skills: Techniques of making effective presentation
Lab 8	Meeting : Conducting meetings effectively
Lab 9	Developing Negotiating skills
Lab 10 &11	Reading Comprehension
Lab 12	Evaluation

References: (Software and Videos)

1. Wordsworth English Language laboratory software
2. Wordsworth Prep 1-2-3
3. Communicate
4. Train 2 Success
5. Additional PPTs

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Course Name **IBM CE - Software Foundation (Advanced) Course with C ++Programming**

Course Code RATSWF4BIN / **DK 2210**

About Technology Software is the invisible thread that exists today in all systems that we see or experience, be it while travelling, shopping, banking, connecting with friends or performing any other routine task. Software not only integrates information, empowers people, connects global ecosystems, and optimizes business processes but, also brings business, people, and the world together.
The technologies and concepts like XML, Information Management and Java form the conceptual foundation of current day software development platforms.

About Course This course provides conceptual and practical knowledge of the Fundamentals of technologies in the context of building enterprise web based applications. The contents of this course will ensure that a student interest in the subject is well founded and sows a seed for a conceptual understanding of software and computing practices of current generation.

Target Audience The Software Foundation course enables students in early stages of undergraduate studies who want to make a career in Information Technology industry.
Students of:
- CS/IT/ECE/EEE Engineering - 1st / 2nd Year
- BCA/ BSC – 1st / 2nd year

Pre-requisites No previous Software knowledge, other than basic computer/Windows usage required. Basic web Programming/HTML and basic database conceptual knowledge is desired.

Contents

1. Introduction to C++
- OOPS
- Essentials of Programming
- Features of C++
- Inheritance, Polymorphism & Encapsulation
  Operator Overloading
- I/O in C++
- Advanced Topics

2. Information Management
- Information as a Service
- IBM Information Management Software
- Order Fulfillment System – Example Case
- Open Source: Derby
- Cloudscape
- DB2 9 pureXML Technology
- DB2 Express-C
- DB2 Data Server Editions
- Information Integration Business Drivers

3. Introduction to XML and Related Technologies
- Issues in information exchange
- What is XML?
- Exercise: XML basics
- Document type definitions (DTDs)
- Exercise: Working with DTDs
- XML namespaces
- Exercise: XML namespaces
- XML schema, part 1
- Exercise: Generating XML schemas
- XML schema, part 2
- Exercise: XML schemas
- XPath

- Exercise: XPath (and quiz)
- XSL transformation: part 1
- Exercise: XSLT part 1 - simple XSL transforms
- XSL transformation: part 2
- Exercise: XSLT part 2 - simple XSL transforms

4. Introduction to Integrated Development Environment – Eclipse

- What is Eclipse
- Eclipse Architecture
- Eclipse Platform Architecture
- Eclipse Plug-in Architecture
- Eclipse Case Studies
- Eclipse Terms and Concepts

5. Java Development Tools

- The JDT environment
- Creating and running a program
- Automating testing with JUnit
- Using Ant and javadoc

6. Debugging Applications

- Using the debugger:
- Starting the debugger
- Setting breakpoints
- Stepping through the code
- Inspecting variables and expressions
- Hot code replace

7. The Eclipse Architecture

- A brief discussion of the Eclipse plug-in architecture
- Finding, installing and updating plug-ins
- Some popular plug-ins

8. Eclipse Web Tools Platform Project 1.0

- Eclipse Web Tools Platform (WTP 1.0) Project
- Web Standard Tools
- J2EE Standard Tools
- The Data Tools Project
- The AJAX Tools Framework

9. Software in Real World:
   The IBM Canvas - some of the tools that students shall learn about and use in their future trainings and projects on the IBM technologies.
10. Software in Real World: The Road Ahead
    The Road Ahead is woven with the overall course content, especially the IBM Canvas to help students in selection of the right career path and the related IBM courses.

Applicable Prometric Certification - NA -

Follow on courses

- IBM CE Minor Projects
- IBM CE – Introduction to Object -Oriented Programming using Java
- IBM CE - Basics of Information Management with DB2
- IBM CE - Basics of IBM Rational Rhapsody
- IBM CE - Introduction to Cloud Computing

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Course Title: **Workshop Practice**			Course Code: **LA1110**
Credit: **1**	L **0**	T **0**	P **2**
Year: **1st**			Semester: **II**

List of Experiments

1. Carpentry: To make a T-Lap joint with soft wood.
2. Arc Welding: To make a Lap joint with mild steel flat by arc welding process.
3. Gas Welding: To make a Lap joint of M.S. sheet with gas welding process.
4. Fitting: To make a plug and socket joint with M.S. flat.
5. Machine Shop: To turn a M.S. rod on lathe to prepare a turning specimen.
6. Sheet Metal: To make a square tray with G.I. sheet.
7. Study of Foundry and Forging tools and equipments

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Course Title: **DATA STRUCTURES**	Course Code: **DA3210**
Credit: **4**	L **3** T **0** P **2**
Year: **2nd**	Semester: **III**

Unit I : **Introduction:** Concept of data structure, Types of data structures, Character String in C, Recursion, Structure, Pointer, Dynamic Allocation, Algorithms, Algorithm analysis, Complexity of algorithms and Time space trade-off.

Arrays: Introduction, Single and multi-Dimensional Arrays, address calculation, application of arrays, Operations defined: traversal, insertion and deletion.

Stacks: Stacks, Array representation of stack, Applications of stacks, Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack.

Unit II : **Queue:** Queue, Array representation and implementation of queues, Circular queues, Operations on Queue: Create Add, Delete, and Full and Empty, De-Queue, Priority queues, Applications of Queues.

Linked Lists: Concept of linked list, Representation and implementation of singly linked list, Circular linked list, doubly linked list, Operations on Linked lists, Concepts of header linked lists, applications of linked lists.

Unit III : **Trees:** Basic terminologies of trees, Binary tree, Complete Binary tree, Extended Binary tree, Representation of Binary tree, Binary tree traversal, Operations on Binary tree.

Binary Search Tree: Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, B-trees.

Unit IV : **Graphs:** Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Representations of Graphs, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.

Unit V : **Searching** & **Hashing:** linear search, binary search, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.

Sorting: Bubble sort, Insertion sort, Selection sort, Quick sort, Merge sort, Heap Sort.

File Handling: Introduction to file handling, Data and Information, File concepts, File organization, files and streams, working with files.

Text Book:

1. Lipschutz, "Data Structures" Schaum's Outline Series, TMH.
2. A. M. Tenenbaum, Langsam, Moshe J. Augentem, Data Structures using C PHI Pub.

Reference Book:

1. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication.
2. Robert Kruse, Data Structures and Program Design in C PHI.
3. Willam J. Collins, Data Structure and the Standard Template library –2003, T.M.H.

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Course Title: **COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES**			Course Code: **DA3220**
Credit: **4**	L **3**	T **0**	P **2**
Year: **2nd**			Semester: **III**

Unit I : **Introduction:** Numbers and their accuracy, Computer Arithmetic, Errors and their Computation, General error formula, Error in a series approximation.

Solution of Algebraic and Transcendental Equation: Bisection Method, Iteration method, Method of false position, Secant method, Newton-Raphson method, Rate of convergence of Iterative, Newton Raphsion methods.

Unit II : **Interpolation:** Finite Differences, Difference tables Polynomial Interpolation**:** Newton's forward and backward formula Central Difference Formulae: Gauss forward and backward formula, Stirling's, Bessel's, Everett's formula. Interpolation with unequal intervals: Langrange's Interpolation, Newton Divided difference Formula.

Unit III : **Statistical Computation:** Frequency chart, Curve fitting by method of least squares, fitting of straight lines, polynomials, exponential curves, Regression Analysis, Linear and Non linear Regression, Multiple regression.

Unit IV : **Numerical Integration and Differentiation:** Introduction, Numerical differentiation Numerical Integration: Trapezoidal rule, Simpson's 1/3 and 3/8 rule, Boole's rule.

Unit V: **Solution of differential Equations:** Picards Method, Eulers Method, Taylors Method, Runge-Kutta Methods, Automatic Error Monitoring and Stability of solution.

Text Book:

1. Pradip Niyogi, "Numerical Analysis and Algorithms", TMH, 1st Edition.
2. Gerald & Whealey, "Applied Numerical Analysis", AW

Reference Book:

1. Grewal B S, "Numerical methods in Engineering and Science", Khanna Publishers, Delhi.
2. Srimamta Pal Numerical Method Principles, analysis and algorithms, (Oxford Higher ed)
3. Rajaraman V, "Computer Oriented Numerical Methods", PHI, 3rd edition.

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Course Name	**IBM CE – Introduction to Object -Oriented Programming using Java**
Course Code	RPROOPJFN/ **DK 3210**
Course Duration	
About the Technology	Java technology is both a programming language and a platform. The *Java programming language* is a high-level, object-oriented language. Java programs are both *compiled* and *interpreted*. Compilation translates Java code into an intermediate language called Java *bytecode*. Bytecode is in turn parsed and run (interpreted) by the Java Virtual Machine (JVM) — a translator between the language and the underlying operating system and hardware. A compiled Java program can run on any system that has a version of the JVM. The *Java platform* is a software-only platform that can run on top of most hardware platforms. It consists of the JVM and the Java API — a large collection of ready-made components (*classes*) that ease application development and deployment. The Java API spans everything from basic objects, to networking and security, to XML generation and web services. It is grouped into libraries — known as *packages* — of related classes and interfaces.
About the course	The course begins with an introduction to the Java programming language and a review of the principles of object-oriented (OO) development before focusing on how to create object-oriented applications in Java. This course includes topics such as recognizing Java constructs that enable object-orientation. The course provides you with an overview of the Java language syntax, including packages, classes, methods, variables, conditional statements, and control flow. You then learn about the role of inheritance and interfaces in Java, how to create and handle exceptions, and how to refactor code. In addition, this course covers various new features of Java SE 5 and Java SE 6, such as generics, autoboxing, and annotations. You also learn about the different Java application programming interfaces (APIs), focusing on the APIs most commonly used in real-world Java applications such as Collections, Input/Output (I/O), Threads, and other utility classes.
Audience	This course is designed for people with little or no Java programming experience. Students of – Engineering (CS, IT, ECE, EEE)
Pre-Requisites	Some programming experience and familiarity with OO programming.
Contents	– State the advantages of an object-oriented approach to software development – Describe essential object-oriented concepts and terminology – Describe the fundamentals of object-oriented programming – Create Java classes that implement an object-oriented design – Apply Java language constructs that enable and enforce OO-related concepts such as data encapsulation, strict typing and type conversion, inheritance, and polymorphism – Use Java syntax to develop applications in Java – Use inheritance and interfaces in Java applications – Refactor Java code – Describe and use some of the important API classes and interfaces available in Java, including: o Primitive wrapper classes o Classes in the Collections Framework o Utility classes o I/O classes o Threads o Exceptions – Use the Java development tools in Eclipse V3.5 – Debug Java programs – Describe Java EE component model and its use in building server-side applications – Develop, debug, and test server-side applications – Develop and test servlets – Develop and test JSP pages – Learn how to use JSPs and servlets in accordance with the Model/View/Controller(MVC) programming model – Develop, test, and use JSP custom tags
Applicable IBM Certification	-
Follow on Courses	– IBM CE - Enterprise Applications Development using Rational Application Developer – IBM CE - Enterprise Applications for Cloud Environment using IBM Rational Application Developer & IBM SmartCloud – IBM CE - Fundamentals of Software Testing with IBM Rational Tools – IBM CE - Enterprise Mobile Application Development and Deployment using IBM Worklight – IBM CE - Fundamentals of Embedded Software development using IBM Rational Rhapsody (Java)

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Course Title: **DISCRETE MATHEMATICS**	Course Code: **DA3010**
Credit: **3.5**	L **3** T **1** P **0**
Year: **2nd**	Semester: **III**

Unit I

Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs, Set Identities.
Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Order of relations.
Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions.
Natural Numbers: Introduction, Mathematical Induction.

Unit II

Partial order sets: Definition, Partial order sets, Combination of partial order sets, Hasse diagram.
Lattices: Definition, Properties of lattices – Bounded, Complemented and Complete Lattice
Boolean algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra. Combinational and sequential Circuits

Unit III

Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem,
Normal Subgroups, Permutation and Symmetric groups, Group Homeomorphisms, Definition and elementary properties of Rings and Fields, Integers modulo n.

Unit IV

Propositional Logic: Proposition, well-formed formula, Truth tables, Tautology, Contradiction, Algebra of proposition, Theory of Inference ,Natural Deduction.
Predicate Logic: First order predicate, well-formed formula of predicate, quantifiers, Inference theory of predicate logic.
Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle.
Probability: Introduction, Conditional Probability & Independence

Unit V

Graphs: Definition and terminology, Representation of graphs, multigraphs, bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring.
Trees: Definition, Binary tree, Binary tree traversal, binary search tree.
Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.

Text Book:

1. Liu C.L., Elements of Discrete Mathematics, McGraw Hill Int. edn.
2. Kolman B & Busby C.R., Discrete Mathematical Structure for Computer Science, Prentice Hall of India Ltd.
3. Deo N., Graph Theory, Prentice Hall of India.

Reference Book:

1. Trembley J.P. & Manohar R., Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill.

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Course Title: **COMPUTER ORGANISATION**			Course Code: **DA3020**
Credit: **3.5**	L	T	P
	3	**1**	**0**
Year: **2nd**			Semester: **III**

Unit I : **Register Transfer and Micro operation**: Register Transfer Language, Bus and Memory Transfers, Bus Architecture, Arithmetic, Logic, Shift Microoperation, Design of ALU, Design of Fast adder.

Computer Arithmetic: Introduction, addition and subtraction algorithms, Booth Multiplication Algorithms, floating point arithmetic operation, IEEE format for floating point numbers.

Unit II : **Processor Organization**: General register organization, Stack organization, Addressing modes, Instruction format, Data transfer & manipulations, Program Control.

Control Design: Single and multiple bus architecture, Execution of a Complete Instruction, sequencing of control signals, Hardwired control, Micro programmed Control, microinstruction format.

Unit III : **Input-Output Organization**: I/O Interface, Modes of transfer, Interrupts & Interrupt handling, Direct Memory Access, Input-Output processor, Serial Communication.

Unit IV : **Memory Organization**: Memory Hierarchy, Main Memory (RAM and ROM Chips), organization of Cache Memory, Virtual Memory, Memory management hardware.

Unit V : **Parallel Processing**: Flynn's classification, Pipelining- Arithmetic Pipelining, Vector Processing, Array Processor.

Multiprocessor: Characteristic of Multiprocessor, Interconnection Structure, Interprocessor Arbitration.

Text Book:

1. M. Mano, Computer System Architecture, Pearson, 3rd Edition.
2. John P.Hayes, Computer Organization, McGraw Hill, 3rd Edition

Reference Book:

1. Vravice, Zaky&Hamacher Computer Organization, (TMH Publication)
2. Tannenbaum,Structured Computer Organization, (PHI)
3. Stallings ,Computer Organization, (PHI)

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Course Title: **Digital System Design**	Course Code: **FA3221**
Credit: 4.5	L: **3** T: **1** P: **2**
Year: **2nd**	Semester: **III**

UNIT-1: INTRODUCTION **8 L**

Number Systems, Basic & Universal Logic gates, Boolean algebra, Direct Conversion of various base, Negative number representations, Floating point number representation, BCD & EXCESS-3 arithmetic, Error detecting and correcting codes: Hamming code, parity code, Review and Limitation of K-Map, Quine-Mcclusky Method (Tabular Method).

UNIT-2: COMBINATIONAL LOGIC CIRCUITS **8 L**

Characterization of digital circuits: Combinational & Sequential Logic circuit, Design procedure: Adders, Subtractors, Parallel Adder, IC-74LS83 and its applications, Multiplier, Decoder, Encoder, Priority Encoder, Multiplexers, Demultiplexers and their applications, Magnitude Comparators, Code Converters, Parity checker and generator, BCD Adder.

UNIT-3: SEQUENTIAL LOGIC CIRCUITS **6 L**

Latch, Flip-Flops and their conversions, Analysis and Synthesis of Sequential Circuits, Excitation Table & Diagram, Counters: Synchronous & Asynchronous, Shift Registers and their applications, Finite State Machine: Mealy and Moore Models.

UNIT-4: MEMORIES **8 L**

Memory Characteristics and operations , Sequential, Random Access-MOS & C-MOS Static and Dynamic Memory elements, Memory organization: One dimensional and Multidimensional Arrangement, Read Only Memory, ROM as a Decoder, Memory Bank, Address Decoding of Memory (Internal & External), PAL, PLA.

UNIT-5: LOGIC FAMILIES, HAZARDS & FAULT DETECTIONS **10 L**

Logic Families: Diode, BJT & MOS as a switching element, concept of transfer characteristics, ECL, TTL, I2L, Tri-state, PMOS,NMOS and CMOS logic families- Power Consumption, Gate delay and Figure of merit (SPP),Package density, Comparison of standard logic families, pass transistor Logic, Open Collector and Totem pole output stage for TTL. Static and Dynamic Hazards, Gate Delay, Generation of Spikes, Analysis & illustration of Hazard in Combinational Circuits, fault Detection Techniques: Path Sensitization, Boolean Difference Method, K- Map Method.

Text Books:

1. Digital Design, M. Morris Mano and M. D. Ciletti, 4th Edition, Pearson

Reference Books:

1. Digital Systems: Principles and Design, Raj Kamal, Pearson
2. Maini, Digital Electronics: Principles and Integrated Circuits, Wiley India.
3. Switching Theory and Finite Automata, Kohavi, TMH Publications.

Digital System Design Lab

1. Implementation of All Logic Gates using Universal gates (NAND & NOR both).
2. Bread-board implementation (Parallel adder, One bit Multiplier, One bit Magnitude comparator, parity checker)
3. Bread-board implementation of any one code converter (i.e. Gray Code, BCD Code, Excess-3, Hex. etc.).
4. Design of shift registers (SISO, SIPO, PIPO, and PISO), up and down counters.
5. Design of Mod-6 types of Asynchronous Counters.
6. Transfer characteristics of TTL and CMOS inverters.
7. Realization of Decoder, Multiplexer, encoder and De-multiplexers using IC 74138.
8. To design & Implement PAL.
9. To design & implement PLA.
10. Clock circuit realization using 555, CMOS inverter.

*Any two (Value Added)

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Course Title: **THEORY OF COMPUTATION**	Course Code: **DA4010**
Credit: **3.5**	L **3** T **1** P **0**
Year: **2nd**	Semester: **IV**

Unit I : Mathematical preliminaries, alphabets, strings, languages, states, transition, transition graph, generalized transition graph, Deterministic Finite Automata, Non-Deterministic Finite Automata, Non-Deterministic Finite Automata with ϵ transitions, minimization of DFA.

Unit II : Conversions and Equivalence: Equivalence between NFA with and without ϵ transitions. NFA to DFA conversion; Equivalence between two DFA's, Limitations of FSM; Application of finite automata, Finite Automata with output- Moore & Melay machine and its conversion

Unit III : Regular Languages: Regular sets; Regular expressions, Arden's theorem, Construction of finite Automata for a given regular expression, Pumping lemma for regular sets. Closure properties of regular sets. Grammar Formalism: right linear and left linear grammars; Equivalence between regular linear grammar and FA,

Context free grammar; Derivation trees, sentential forms. Ambiguity in context free grammars; Normal forms: Chomsky normal form and Greibach normal form; Pumping Lemma for Context Free Languages, Closure property of CFL.

Unit IV : Push Down Automata: Push down automata, definition; Acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence; Equivalence of CFL and PDA; Introduction to DCFL and DPDA.

Unit V : Turing Machine: Turing Machine, definition, model, Design of TM, Computable functions Church's hypothesis, Types of Turing machines: Universal Turing Machine, Halting problem, Properties of recursive and recursively enumerable languages, unsolvable decision problem, undecidability of Post correspondence problem, Church turing Thesis.

Text Book:

1. Hopcroft H.E. and Ullman J. D ,"Introduction to Automata Theory Language and Computation",., Pearson Education.
2. J. C. Martin, "Introduction to Languages and the Theory of Computation",3rd edition, Tata McGraw-Hill.
3. C.K.Nagpal, "Formal Languages and Automata Theory", Oxford..

Reference Book:

1. Cohen, "Introduction to Computer theory", Wiley India."Elements of Theory of Computation", Lewis H.P. &Papadimitrou C.H. Pearson, PHI.

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Course Title: **Microprocessors**			Course Code: **FA52A0**
Credit: 4.5	L	T	P
	3	**1**	**2**
Year: **3rd**			Semester: **V**

Unit 1

Introduction To Microprocessor: 8085 Evolution Of Microprocessor, Register Structure, ALU, Bus Organization, Timing And Control, instruction set.

Architecture of 16-bit Microprocessors: Architecture of 8086; (Bus Interface Unit, Execution unit) Register Organization, Bus operation, Memory segmentation.

Unit 2

Assembly Language Programming: Addressing Modes and instruction set of 8086, Arithmetic and Logic instructions, Program Control Instructions (jumps, conditional jumps, subroutine call) Loop and string instructions , Assembler Directives.

Unit 3

CPU MODULE: Signal Description of pins of 8086 and 8088, Clock generator, Address and Data bus Demultiplexing, Buffering Memory Organization, Read and Write cycle Timings, Interrupt Structures, Minimum Mode, Maximum Mode Operation.

Unit 4

Peripheral Interfacing: Programmed I/O, Interrupt Driven, I/O, DMA, Parallel I/O, (8255-PPI, Parallel port), 8253/8254 programmable Timer/Counter Interfacing with ADC.

Unit 5

Peripheral Interfacing (Contd.): 8259 Programmable Interrupt controller, 8237 DMA controller, Concept of Advanced 32 bit Microprocessors: Pentium Processor.

Text Book:

1. Ray,A.K. &Burchandi, K.M., "Advanced Microprocessors and Peripherals: Architecture, Programming and Interfacing", Tata McGraw Hill.
2. Hall D.V. , "Microprocessors Interfacing" ,2nd edition, Tata McGraw Hill

Reference Books

1. Gaonkar, Ramesh S., "Microprocessor Architecture, Programming, and Applications with the 8085", Pen Ram International Publishing , 5th edition
2. B.P. Singh &Renu Singh, "Microprocessors and Microcontrollers", New Age International.
3. Liu and Gibson G.A. , "Microcomputer Systems: The 8086/8088 Family", Prentice Hall (India), 2nd edition
4. Brey, Barry B. , "INTEL microprocessors", Prentice Hall (India), 4th edition
5. Ram B., "Advanced Microprocessor & Interfacing" , Tata McGraw Hill
6. Renu Singh & B.P. Singh, "Microprocessors and Interfacing & Applications", New Age International.

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Course Title: **COMPUTER NETWORKS**			Course Code: **DA4210**
Credit: **4**	L	T	P
	3	**0**	**2**
Year: **2nd**			Semester: **IV**

Unit I : **Introduction:** Motivation, OSI model, Signals and media, Bits over signals, Synchronous communication, Modulation and modems, Bandwidth, Throughput, and noise, Time division and Frequency division multiplexing, Standards, Switching methods, ISDN.

Unit II : **Packet Transmission:** Multiplexing, Frames, Error correction techniques, LAN/WAN/MAN, Topology, CSMA/CD,LAN protocol, Elementary Data link protocol- Sliding window protocols, Token passing rings, FDDI, IEEE 802.3, 802.5.

Unit III : **Routing Algorithms:** Distance-Vector, Link-State, Shortest path computation, Dijkstra's algorithm, Congestion control, WAN technologies including frame relay, X.25, ATM.

Unit IV : **Internetworking:** Motivation, Concept, Goals, TCP/IP model, IP addressing with sub netting, Address binding with ARP, IP Datagram, Encapsulation IP fragmentation and reassembly, ICMP,IGMP,TCP.

Unit V : **Network Services:** Electronic mail, File transfer, Access and management, Virtual terminals, Remote procedure call.

Text Book:

1. Forouzan, B.A., Data communication and Networking, McGraw Hill (2006) 4th ed.
2. Tanenbaum, A.S., Computer Networks, Prentice Hall (2003) 4th ed.

Reference Book:

1. Comer, D.E., Internetworking with TCP/IP Vol. 1 Principles, Portals and Architecture, Prentice Hall of India (2005) 5th ed.
2. Stallings, W., Computer Networking with Internet Protocols and Tech., Prentice Hall of India (2007).

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Course Title: **WEB TECHNOLOGY**			Course Code: **DA4220**
Credit: **4**	L	T	P
	3	**0**	**2**
Year: **2nd**			Semester: **IV**

UNIT 1

Web Essentials: Clients, Servers, and Communication. The Internet - Basic Internet Protocols - The World Wide Web-HTTP request message - response message - Web Clients Web Servers.

Markup Languages: An Introduction to HTML History-Versions-Basic Syntax and Semantics-Some Fundamental HTML Elements-Relative URLs-Lists-tables-Frames-Forms, Pages style sheets-CSS- Core Syntax- Properties-Box Model Normal Flow Box Layout-Other Properties.

UNIT 2

Client- Side Programming: The JavaScript Language-History and Versions Introduction JavaScript in Perspective-Syntax - Variables and Data Types – Statements – Operators – Literals – Functions – Objects – Arrays - Built-in Objects - JavaScript Debuggers, Browsers and the DOM.

PHP: Starting to script on server side, Arrays, function and forms, Advance PHP.

UNIT 3

Representing Web Data: XML-Documents and Vocabularies-Versions and Declaration-Namespaces JavaScript and XML: Ajax-DOM based XML processing Event-oriented Parsing: SAX-Transforming XML Documents-Selecting XML Data: XPATH-Template based Transformations: XSLT-Displaying XML Documents in Browsers-Case Study- Related Technologies, Introduction to JQuery.

UNIT 4

Web Services: Introduction to Web Services, UDDI, SOAP, WSDL, Developing and deploying web services. Ajax – Improving web page performance using Ajax, Programming in Ajax.

UNIT 5

Web 2.0: Interactive and social web**:** Blogs, wikis, and social networking sites – The technology behind these applications - AJAX, Open APIs.

Web 3.0: Semantic Web, Mashups, RDF, Web based Information Systems, Search engines, Recommender Systems, Web Mining.

Text Book:

1. Jeffrey C.Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.57

Reference Book:

1. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007.
2. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006.
3. Marty Hall and Larry Brown,"Core Web Programming" Second Edition, Volume I and II, Pearson Education, 2001.
4. Bates, "Developing Web Applications", Wiley, 2006.

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Course Name **IBM CE - Basics of Information Management with DB2**

Course Code IMDB2BIN / **DK 4250**

About Technology Information Management software offers you end-to-end capabilities to manage data and content, pull together information from diverse sources, and gain valuable insights to optimize business processes.

At the core of IBM's software solution for information management is a powerful family of relational database management system (RDBMS) servers, which provides the right capabilities to manage data and support operational and analytic applications. The integrated data management portfolio provides a modular environment to design, develop, deploy, operate, optimize, and govern data, databases, and data-driven applications. IBM also provides a unified, powerful data warehousing and business intelligence software that gathers, manages, and analyzes data.

About Course This course introduces the features, functions, and services provided by DB2, a relational database management system. Topics covered include: installation; data modeling and design; relational databases; database query languages; relational database design; distributed databases; physical database design; information storage and retrieval; and mapping DB2 vs. Oracle.

Target Audience The Information Management course enables students in early stages of undergraduate studies with an understanding of Relational Database Management concepts and its application in current day data management applications.

Students of:

- CS/IT/ ECE/EEE

Pre-requisites No previous Software knowledge, other than basic computer/Windows usage required.

Contents

Relational Databases	Installation and Planning
Data Modeling	Data Modeling and Database Design
Relational Databases	Introduction to RDBMS
	Understanding a table
	Relational Concepts
Database Query Languages	Simple SQL Queries
	Retrieving Data from Multiple Tables
	Scalar Functions and Grouping
Database Query Languages	Column Functions and Grouping
	Union
	Using Sub-queries
Relational Database Design	Views and Results during DB Design
	Problem Statement
Relational Database Design	Entity Relationship Model
Relational Database Design	Data and Process Inventories
Relational Database Design	Tuple Types
	From Tuple Types to Tables
Relational Database Design	Integrity Rules
Relational Database Design	Indexes
	Logical Data Structures
Distributed Databases	Distributed Data
Physical Database Design	Physical Implementation
	Intermediate SQL
	Maintaining Data
Information Storage and Retrieval	Creating and Accessing DB2 Databases
	Planning Disk Usage
	Data Migration Methods – Loading Tables
	Capacity Management
Information Storage and Retrieval	Data Moving Data
Mapping	DB2 vs. Oracle

Applicable Certification - NA -

Follow on courses

- IBM CE Introduction to Object -Oriented Programming using Java
- IBM CE - Fundamental Course in DB2 - Database Administration for Linux, Unix and Windows
- IBM CE - Fundamentals of Software Testing with IBM Rational Tools

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Batch: 2016-20

Course Title**: LINUX ADMINISTRATION AND SHELL PROGRAMMING**	Course Code: **DA4242**
Credit: **4**	L **3** T **0** P **2**
Year: **2nd**	Semester: **IV**

UNIT I

Introduction to Linux and Unix, What is an operating system?,A brief history of UNIX,Architecture of the Linux operating system,Logging into (and out of) UNIX systems,Changing your password,General format of UNIX commands. The UNIX filesystem, Typical UNIX directory structure ,Directory and file handling commands ,Making hard and soft (symbolic) links,Specifying multiple filenames,Quotes.

File and directory permissions ,Inspecting file content ,Finding files,Finding text in files,Sorting files,File compression and backup,Handling removable media ,Processes,Pipes,Redirecting input and output,Controlling processes associated with the current shell ,Controlling other processes

UNIT II

Introduction to vi,Basic text input and navigation in vi ,Moving and copying text in vi,Searching for and replacing text in vi,Other useful vi commands,Quick reference for vi ,Introduction to emacs,Basic text input and navigation in emacs,Moving and copying text in emacs,Searching for and replacing text in emacs,Other useful emacs commands ,Other UNIX editors. The superuser root,Shutdown and system startup,Adding users ,Controlling user groups ,Reconfiguring and recompiling the Linux kernel ,Cron jobs,Keeping essential system processes alive.

UNIT III

Unix Shell programming: Types of Shells, Shell Metacharacters, Shell variables, Shell scripts, Shell commands, the environment, Integer arithmetic and string Manipulation, Special command line characters, Decision making and Loop control, controlling terminal input, trapping signals, arrays.

UNIT IV

Introduction of python Shell script

Need for Python, Basic programming fundamentals, Data variables, Operators, First Python program ,Control Structures, String Inbuilt functions, Code flow, Indentation in Python, Knowledge about Python data structures with strings, lists, sets, tuples and dictionaries, Standard library modules introduction with examples. re module usage with functions like split, search, findall , compile etc.

UNIT V

Need of a file. Opening, closing and read/write operations in file., Python errors, exceptions, raising the exception and debugging concept, Basic OOP concepts, Creating classes and objects, Class variables and Object Variables, Method Invocation, Static, Class and Instance Methods, Relationships, Overloading methods, Data Hiding,

Database Programming using Python (Oracle database plugin), Web and CGI Programming using Python.

Text Book:

1. Sumitabh Das, "Unix Concepts and applications", TMH, 2003

2. Yashwant Kanitkar, "Unix Shell Programming", BPB, 2009

Reference Book :

1. Parata, "Advanced Unix programming guide", BPB

2. Meeta Gandhi, Tilak Shetty, Rajiv Shah, "The 'C' Odyssey Unix – the open boundless C", BPB.

3. Mike Joy, Stephen Jarvis, Michael Luck, "Introducing Unix and Linux", Palgrave Macmillan.

4. Rachel Morgan, Henry McGilton, "Introducing Unix System V", TMH

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Batch: 2016-20

Course Title: **Probability & Random Variable**	Course Code: **JA5010**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: 3rd	Semester: **V**

UNIT 1:

Theory of Probability & Concept of Random Variable

Axioms of probability: set theory, probability space, conditional, probability. Introduction, distribution and density functions, specific random variables, conditional distributions.

UNIT 2 :

Multiple Random Variables

Bi-variate distributions, one function of two random variables, two functions of two random variables, joint moments, joint characteristic functions, conditional distributions Multiple random variables, sequences of random variables

UNIT 3:

Concept of Stochastic Processes & Random Walks and Other Applications

Definition, systems with stochastic inputs, power spectrum, discrete-time processes. Random walks, Poisson points and shot noise, cyclo-stationary Processes, band-limited processes and sampling theory, deterministic signals in noise.

UNIT 4:

Spectral Representation and Estimation & Mean Square Estimation

Factorization and innovations, finite-order systems and state variables, spectral representation of random processes, ergodicity, spectrum estimation. Prediction, filtering and prediction, Kalman filters. Entropy: Basic concepts, random variables and stochastic processes, MEM.

UNIT 5:

Markov Chain & Queuing Theory

Introduction, higher transition probabilities and the Chapman-Kolmogorov equation, classification of states, stationary distributions and limiting probabilities, transient states and absorption probabilities, branching processes. Markov processes.

Characteristics of Queuing Theory, Queuing Models, Birth & Death Process, Little's Theorem.

Text Books:

1. Probability, Random Variables and Stochastic Processes/A. Papoulis & S. U. Pillai / 4th ed./TMH

Reference Books:

1. Probability, Random Variables & Random Signal Principles/Peyton Z. Peebles, Jr. / TMH

2. Probability & Queuing Theory, R. H. Chitale, Technical Publication Pune

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Batch: 2016-20

Course Title**: OPERATING SYSTEMS**			Course Code: **DA5020**
Credit: **3.5**	L **3**	T **1**	P **0**
Year: **3rd**			Semester: **V**

Unit I

Introduction: Components of a computer System, Operating system: User view & System view, Evolution of operating system, Single Processor & Multiprocessor systems, Real Time System, Distributed Systems, Multimedia Systems, Handheld Systems.

Operating System Structure: Operating System Services, User Operating System Interfaces: Command-Line and GUI, System Calls,

Unit II

Process Management: Process Concept, Process States, Process Transition Diagram, Process Control Block (PCB).

CPU Scheduling: Scheduling Concepts, Performance Criteria, Scheduling Queues, Schedulers, Scheduling Algorithms: Preemptive & Non Preemptive: FCFS, SJF, Priority, Round-Robin.

Unit III

Concurrent Processes: Principle of Concurrency, Producer / Consumer Problem, Co-operating Processes, Race Condition, Critical Section Problem, Peterson's solution, Semaphores, Classical Problem in Concurrency- Dining Philosopher Problem; Inter Process Communication models and Schemes.

Deadlock: System Model, Deadlock Characterization, Prevention, Avoidance and Detection, Recovery from deadlock.

Unit IV

Memory Management: Bare machine, Resident monitor, Multiprogramming with fixed partition, Multiprogramming with variable partition, Multiple base register, Paging, Segmentation, Virtual memory concept, Demand paging, Performance, Paged replaced algorithm, Allocation of frames, Cache memory.

Unit V

File System: Different types of files and their access methods, various allocation methods.

I/O Management and Disk Scheduling: I/O Devices, Organization of I/O functions, Disk Structure, Disk Scheduling (FCFS, SSTF, SCAN, C-SCAN, LOOK).

Text Book:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley.
2. D M Dhamdhere, "Operating Systems : A Concept based Approach", 2nd Edition.

Reference Book:

1. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education. Harvey M Dietel, " An Introduction to Operating System", Pearson Education

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Batch: 2016-20

Course Title**: ALGORITHMS: ANALYSIS & DESIGN**	Course Code: **DA5210**
Credit: **4**	L **3** T **0** P **2**
Year: **3rd**	Semester: **V**

Unit-I

Introduction: Algorithms, Performance Analysis: Space and Time Complexity, Asymptotic Notations- Big Oh, Omega, theta notations, finding complexity of the algorithm, Linear Sorting: Insertion sort, Bubble sort, selection sort.

Unit -II

Advanced Data structures: B-Tree, Binomial Heaps, Fibonacci Heaps, Red & Black Tree.
Divide and Conquer: General method, binary search, quick sort, merge sort, heap sort,

Unit -III

Greedy Method: General method, Activity Selection, job scheduling with deadlines, fractional knapsack problem, Minimum cost spanning tree: Kruskal's and Prim's, single source shortest path, Huffman tree.
Amortized analysis
Unit - IV

Dynamic Programming: General Method, 0-1 Knapsack, Matrix chain multiplication, longest subsequence, all pair shortest paths,
Backtracking- Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.

Unit -V

Branch and Bound: Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.
NP-Hard and NP-Complete problems: Basic Concepts, non-deterministic algorithms, NP-Hard and NP-Complete classes , Cooks Theorm.

Text Book:

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, "Introduction to Algorithms", PHI Pvt. Ltd., 20012.
2. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia,2003 3.
3. M.T.Goodrich and R.Tomassia , Algorithm Design: Foundations, Analysis and Internet examples, Johnwiley and sons.

Reference Book:

1. R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, Introduction to Design and Analysis of Algorithms A strategic approach, McGraw Hill.
2. Aho, Ullman and Hopcroft ,Design and Analysis of algorithms, ,Pearson education.
3. Ellis Horowitz, Satraj Sahni and Rajasekharam, Fundamentals of Computer Algorithms, Galgotia publications pvt. Ltd.

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Batch: 2016-20

Course Title**: APPLICATION SECURITY**			Course Code: **DM5210**
Credit: **4**	L **3**	T **0**	P **2**
Year: **3rd**			Semester: **V**

Course Objective:

The objective of this course is familiarizing the students with the concepts of The Application Security Engineer career path prepares students to scan web applications against vulnerabilities and attacks. This will require skills in web application security such as scanning, and testing application in order to identify and analyze security vulnerabilities. Training topics will include OWASP security standards, Glass box scanning, cross-site scripting, broken authentication, cross-site request forgery and threat analysis and reports.

Unit I : **Security Overview:** Describe the threats and leaks that are emerging as the world is becoming digitalized, Data explosion, Consumerization of IT, Attack sophistication, How motivation and sophistication is evolving rapidly.

Describe sampling of security incidents by attack type, time, and impact, Understand what security discussions have risen to the boardroom ,Understand how security challenges are impacting innovation, Understand that security skills are hard to attract and maintain, Describe what goes into solving a security issue.

New approach to security is needed in terms of intelligence, innovation, and integration, How intelligence can be applied to security, How innovation can be applied to security, How integration can be applied to security.

IBM's approach to Cyber Security, Understand IBM's approach to cyber security, Describe the key understanding of IBM's approach, IBM's 10 essential practices for an optimal security posture.

Describe how the IBM Security Framework can address challenges of cost, complexity, and compliance, security strategy, risk, and compliance , cyber security assessment and response, the security operations optimizations and implementation ,how to identify and access management data and application/SDLC ,Infrastructure and endpoint security services ,Understand managed security services. Describe security intelligence ,what an optimized security intelligence platform provides

Understand IBM's history with security intelligence. The global coverage and security awareness that IBM can provide, IBM's recognition in the marketplace

Unit II : **Application Security Foundations:** Understand relational database concepts, how to work with Entity-Relationship diagrams, constraints, Create an Entity-Relation diagram ,Derive relationships ,Map entities to tables ,Identify different aspects of the Relational Model, Create an Entity-Relation diagram ,Derive relationships, Map entities to tables ,Identify different aspects of the Relational Model, how to create, modify, and delete database objects such as tables, Create tables, Create tables using ALTER TABLE syntax ,Drop tables. Read data from a database using the SELECT statement, Compose select statements. Insert data using the INSERT statement, Update

data using the UPDATE statement, Delete data using the DELETE statement, Write DML statements given some requirements. Work with JOINs, Use JOINs in SQL.

Unit III : **Introduction to HTML5 and JavaScript Programming:** What HTML does, objectives of HTML5,The document types that are supported in HTML5,Describe the document object model (DOM) tree ,Describe some of the differences between HTML4 and HTML5 ,List some HTML document API properties and methods ,Describe how scripting is enabled in browsers, browser support for HTML5 features. JavaScript primitives and objects, how variables are declared and used in JavaScript , control structures, functions in JavaScript, document object model (DOM) hierarchy ,the window and document objects, Identify the DOM objects that are commonly used in JavaScript applications for working with HTML documents. Create HTML web pages, Use style statements in HTML documents, Connect scripts to documents, Write JavaScript functions, Create interactive alert and confirm window objects, Use JavaScript to modify the document object model (DOM).List new elements in HTML5, HTML5 structural elements: section, article, header, footer, figure, fig caption the attributes of the HTML5 input element: tel, email, date time, number, range, color. Create a web page and insert a simple HTML5 form layout, Add new markup elements Use input types that include attributes such as email to perform client-side validation, Test the application

Unit IV: **Application security engineer:** Describe the threat that Web application security poses in the world today: "The problem"
Identify those organizations that are trying to help and remediate web application security vulnerabilities.

Describe the common components of Web applications, Think of HTML and HTTP in their most basic forms.
Describe the injection flaw vulnerability, Perform a SQL injection attack, how SQL injection can be used to exploit an application. List the implications of weak authentication mechanisms and session management flaws.
Describe how hackers use the following attacks

- Session hijacking
- Session fixation
- Weak session management
- Weak authentication management

Implement the following and other types of authentication controls

- Repair weak authentication
- Prevent session hijacking

Strengthen session management
Perform a brute-force attack, the cross-site scripting exploit process, Compare how advanced cross-site scripting and phishing attacks are performed ,Use the following techniques to protect against cross-site scripting attacks- Validate input ,Encode output ,Canonicalization.
Use a script to get access to your cookies and discuss how this concept could be used to retrieve other user's
Cookies, Describe the possible effects of insecure direct object reference flaws, Protect resources from insecure direct file reference exploits, Modify URL in static content on the Altoro site, Bypass the problem when a site informs you that only html and txt content can be displayed, List security misconfiguration vulnerability types, Use best practices to combat security misconfiguration vulnerabilities in your, Directory listings, Application test scripts, Application default files. How SQL injection can be used to exploit an application.

Determine data that requires additional protection, List sensitive data exposure vulnerabilities that include the following

- Secure attributes
- Unenforced encryption
- SSL GET requests
- Sensitive information in HTML comments

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Unit V : **Web Application Security Solution Fundamentals:** Diagram the interactions between these components:

- The web application security solution Enterprise Server
- The web application security solution Enterprise Dynamic Analysis Scanner
- The web application security solution Source

Describe web application security solution and its uses
Summarize how to use web application vulnerability testing in the context of the software development lifecycle (SDLC).

Identify the system requirements of the web application vulnerability testing, Install a web application vulnerability testing solution, including extra components, Obtain and install the web application vulnerability testing license the web application vulnerability testing user interface on your desktop
Describe application scanning and risks, Mitigate the risks of scanning an application, Profile an application for testing, Explain the testing process in web application vulnerability scanner, Specify the limitations of web application vulnerability scanner
Ensure good application coverage; Create a scan by using the Scan Configuration wizard

- Starting web addresses and additional domains
- Login methods
- Appropriate test policy

Use the scan expert to correct some common scan configuration issues-Create a scan, what the scan expert tool does, Run a scan, Browse the security web application solution results tree, information about, verify, and fix discovered vulnerabilities, Filter false positives, Describe the issue state, including noise, Determine issue severity, Retest an issue, Examine an issue to determine if it is real, Change the severity of a vulnerability
Retest vulnerability, Describe the various types of reports

Export scan results for use by other systems Create a report, Create a PCI report

Export the scan data to XML, Describe session management and how it is used in the security web application solution, Troubleshoot in-session detection, Conduct privilege escalation tests.

Create a privilege scan, Run a privilege scan, Understand the scan limit settings

Determine when to turn on the Execute JavaScript setting, Configure the web application security solution to run JavaScript
Configure the web application security solution to scan Adobe Flash-based applications
Set up the web application security solution to use different user-agents and browser types, Use the redundant path limit, Configure other explore options, Understand how to use environment definitions to focus your scan, Use exclusions to limit the scan, Apply custom error pages to reduce false positives, Use multistep operations to scan a sequence of pages, Refining scan speed with communication and proxy settings-Exclude a folder, Create multistep operation, Use the communications and proxy settings-Understand the advantages of glass box scanning, Configure the

security web application solution for glass box scanning-Configure the security platform to use megascripts, Extract hierarchical names from page content-Recognize and troubleshoot communications issues, Minimize redundancies in scanning with redundancy tuning, Verify and optimize scan coverage-Describe a web service and how it works, Explain how to test a web service-Describe and use the eXtension framework, Understand how to install an eXtension-Summarize the initial steps to take before contacting support, Explain the types of log files

Describe common cases, troubleshooting tips, and possible resolutions, Enable extended support mode, Use a scan to troubleshoot.

Learning Outcomes:

Having successfully completed this course, the student can:

1. Describe the emerging threats and leaks as the world is becoming digitalized
2. Understand the security dynamics of securing the enterprise
3. Understand the IT security frameworks
4. Understand relational database concepts and how to work with database objects
5. Describe how to work with select statements, DML statements, and multiple tables

Reference Book:

1. IBM COURSEWARE.

Course Title: **Principles of Management**	Course Code: **HA5010**
Credit: 2	L: **2** T: **0** P: **0**
Year: **3rd**	Semester: **VI**

UNIT – 1

Introduction to Management

Theories of management: Traditional behavioral, contingency and systems approach. Organization as a system.

UNIT – 2

Management Information

Interaction with external environment, Managerial decision making and MIS.

UNIT – 3

Planning Approach to Organizational Analysis

Design of organization structure; Job design and Enrichment; Job evaluation and merit rating.

UNIT – 4

Leading and Control

Theories of motivation, Leadership styles and managerial grid. Co-ordination, Monitoring and Control in organizations. Techniques of Control. Japanese management techniques.

Minor Project: Submission of 15 pages of Case Studies on above.

Suggested Books:

1. Peter Drucker, Harper and Row: The Practice of Management.
2. *Koontz H,* Weihrich,H. Essentials of Management, *Tata McGraw-Hill* Education, 2006.
3. Schermerhorn, John R. Management and Organizational Behavior Essentials, Wiley India,2005
4. Staner: Management, PHI Learning
5. Hirschey. Managerial Economics, Cengage Learning, 2009.
6. Chhabra, A. Principle of Management, Sun India publication , 2012

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Course Title**: COMPUTER GRAPHICS**			Course Code: **DA6210**
Credit: **4**	L	T	P
	3	**0**	**2**
Year: **3rd**			Semester: **VI**

Unit I : **Introduction to computer graphics and primitives algorithms:** Points, planes, pixels and frames buffers, lines, circles and ellipse drawing algorithms, display devices, primitive devices, applications of computer graphics.

Unit II : **Two-Dimensional Transformation:** Introduction to transformation matrix, **Types of transformations in 2-D:** Identity Transformation, Scaling, Reflection, Shear Transformation, Rotation, Translation, Rotation about an arbitrary point, Combined Transformation, Homogeneous coordinates, 2-D transformation using homogeneous coordinates.

Unit III : **Three-Dimensional Transformation:** Objects in homogeneous coordinates, **3-D Transformation:** Scaling, Translation, Rotation, Shear Transformations, Reflection, world coordinates and viewing coordinates, Projection, parallel Projection, Perspective projection. **Hidden Lines and Surfaces:** Back face removal algorithms, Hidden lines methods..

Unit IV : **Viewing and Solid Area Scan-Conversion:** Introduction to viewing and clipping, viewing transformation in 2-D, Point Clipping, Line Clipping, Introduction to polygon Clipping, Viewing and clipping in 3-D, Three Dimensional Viewing Transformations, Text Clipping, generalize Clipping, Multiple windowing.

Introduction to Solid Area Scan: Conversion, Inside-Outside Test, Winding Number Method and Coherence Property, Polygon Filling, Seed Fill Algorithms, Scan Line Algorithm, priority Algorithm, Scan Conversion of Characters, Aliasing, Anti-aliasing, Halfoning, Threshold and Dithering.

Unit V : **Introduction to curves:** Curves Continuity, Conic Curves, Piecewise Curve Design, Spline curve representation, Bezier Curves, Fractals and its Applications.

Object rendering: Introduction to Object Rendering, Shading, Ray Tracing, Illuminational model, Colour Models.

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Text Book:

1. R.K. Maurya, Computer Graphics, John Willey.
2. David F. Rogers, Procedural Elements of Computer Graphics, Tata McGraw Hill.

Reference Book:

1. Donald hearn and M.Pauline Beaker, Computer Graphics, Prentice Hall of India.
2. Steven Harrington, Computer Graphics, McGraw Hill.

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Course Title: **DOT NET TECHNOLOGIES**	Course Code: **DA6220**
Credit: **4**	L: **3** T: **0** P: **2**
Year: **3rd**	Semester: **VI**

Unit I : **Introduction to C#:** C# Language Fundamentals: An Anatomy of a basic class, Creating objects: Constructor basic, the composition of an application, Default Assignment and variable scope, member initialization syntax, Basic input and output with the console class, Understanding value types and reference types, the master node: System. Objects, The system Data type (And C# aliases), Converting between value type and reference type: Boxing and Unboxing, Defining program constraints, Iterations constructs, control flow constructs, The complete set operator, Defining Custom class methods, Understanding static methods, Method parameter modifiers, Array manipulation, String manipulation, Enumerations, Defining structures, Defining custom namespaces.

Unit II : **Object Oriented Aspects Of C#:** Formal definition of the class, Definition the "Default public interface" of a type, Recapping the pillars of OOP, The first pillar: Encapsulation services, Pseudo Encapsulation: Creating read only field, The second pillar: Inheritance supports keeping family secrets: The "Protected" keyword, The Nested type definitions, The third pillar: Polymorphic support casting between types, Generating class definitions using Visual Studio.Net. Exceptions and Objects Life Time Ode to errors, Bugs and exceptions, the role of .NET exceptions handling, the system. Exception base class throwing a generic exception catching exception, CLR system level exception(System. system exception), Custom application level exception (System. application exception), Handling multiple exception, The finally block The last chance exception, dynamically identify application and system level exception, Debugging system exception using VS.Net, Understanding Object life time, The CIT of new, The basic of garbage collection, Finalizing a type, Finalization process, building and Ad hoc destruction method, garbage collection optimization, The system .GC type.

Unit III : **The Clr And The .Net Framework:** The building Block of the .NET platform (CLR,CTS,CLS), the role of the .NET base class libraries, , additional .NET Aware programming Languages, Understanding .Net Assembles, Problems with classic COM Binaries, The role of the common intermediate language, The role of .NET type metadata, The role of the assembly manifest, Compiling CIL to platform specific instruction. Building a simple file test assembly, Cross Language Inheritance. Building the multi file assembly, Using the multi file assembly, Understanding private assemblies, robing for private assemblies (The Basics), Private assemblies and XML Configuration files, Probing for private assemblies (The details),Understanding Shared assembly, Understanding Shared Names, Building a shared assembly, Understanding delay Signing, Installing/Removing shared assemblies, Using a Shared assembly.

Unit IV : **Application Development On .Net:** Using the visual studio.Net IDE, key aspects of the VS.Net IDE, Documenting source code via XML, Building Windows Applications, Event Driven Programming, Delegate, Event and its association, Synchronous and asynchronous operation with delegate, User Defined events and delegates,ADO.NET Architecture,.NET Framework Data Providers, Data set, Data reader, data adapter, Accessing Data with ADO.NET..

Unit V : **Web Based Application Development On .Net:** Introduction to web form, Need of Web Application, Static and Dynamic Page, Working of IIS and Browser, Differences between ASP and ASP.NET, understanding post back, understanding page life cycle, State management, Server control form validation, Master pages, ASP.NET web security, server control form validation, Programming Web Applications with Web Forms, Web service, Programming Web Services

Text Book:

1. E. Balagurusamy, "Programming in C#", Tata McGraw-Hill, 2004. (Unit I, II)
2. J. Liberty, "Programming C#", 2nd ed., O'Reilly, 2002. (Unit III, IV, V)

Reference Book:

1. Herbert Schildt, "The Complete Reference: C#", Tata McGraw-Hill, 2004.
2. Robinson et al, "Professional C#", 2nd ed., Wrox Press, 2002.
3. Andrew Troelsen, "C# and the .NET Platform", A! Press, 2003.
4. S. ThamaraiSelvi, R. Murugesan, "A Textbook on C#", Pearson Education, 2003.

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Course Title: **COMPILER DESIGN**	Course Code: **DA6230**
Credit: **4**	L: **3** T: **0** P: **2**
Year: **3rd**	Semester: **VI**

Unit I : **Introduction:** Review of Languages & Grammar, Compiler and Interpreter- Basic Concepts. Phases and Passes, Design Issues using Finite State Machines, Scanner Generator- LEX. Formal Grammar and their application to Syntax Analysis, Ambiguous Grammar, The Syntactic specification of Languages: CFG, Derivation and Parse Trees, Capabilities of CFG, BNF Notation.

Unit II : **Basic Parsing Techniques:** Parsing-Top Down and Bottom-Up Strategies: General Consideration. Top Down Parsing: Brute-Force Method, Recursive Descent, & Predictive Paring. Bottom-Up Parsing: Shift Reduce Parsing, Operator Precedence Parsing. LR Grammars-LR(0), SLR(1), Canonical LR(1) & LALR(1) Parser, Comparison of parsing methods.

Unit III : **Semantic Analysis:** Basic Concepts, Syntax Directed Definitions-Inherited & Synthesized Attributes, Evaluation Orders of SDDs. Syntax directed Translation Schemes, Intermediate Codes, Postfix notation, Parse Trees and Syntax Trees, Directed Acyclic Graphs, Three address Codes: Quadruple & Triples, Translation of Assignment Statements, Boolean expressions, Control Statements, Postfix Translation, Translation with a Top Down Parser, Array References in Arithmetic expressions, Procedure Calls, Declarations and Case statements Translations.

Unit IV : **Symbol Tables:** Organization of Non-Block Structured Language (Unordered /Ordered/ Tree/ Hash) and Block Structured Language (Stack Tables & Stack Implementation), Runtime Storage Management: Static Allocation, Dynamic Allocation- Activation Records and their usage, Recursive Procedure. Heap Allocation-Storage Registers and Release Strategies.

Unit V : **Error detection and Recovery:** Code Optimization- Basic Blocks and Optimization, Loop Optimization, Flow Graph Analysis, Machine Dependent Optimization.

Error Handling: Detection, Reporting, Recovery and Maintenance, Compiler-Compiler—YACC, Code Generation, Concept of Compiler Design for Object-Oriented Language.

Text Book:

1. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, "Compilers-Principles, Techniques & Tools", Pearson Education

Reference Book:

1. Robin Hunter, " Essence of Compilers", Pearson Education
2. Steven S. Muchnick, Advanced Compiler Design & Implementation, Morgan Kaufmann Publishers

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Batch: 2016-20

Module Title : OOAD & Software Development Life Cycle
Course Code : DK 6050

Indicative Contents:

Coverage
Best Practices of Software Engineering, Concepts of Object Orientation, Essentials of Visual Modeling
Requirements Overview, Analysis and Design Overview, Architectural Analysis, Use-Case Analysis
Identify Design Elements, Identify Design Mechanisms
Describe the Run-time Architecture, Describe Distribution, Use-Case Design, Objectstore Mechanism, Security Mechanism, UML to C++ Mapping, UML to Java Mapping, UML to Visual Basic Map, UML to Visual Basic Map

Course Title: **Engineering Economics**	Course Code: **GC5010**
Credit: 2	L: **2** T: **0** P: **0**
Year: **3rd**	Semester: **VI**

UNIT-I

Time value of money: Simple and compound interest, Time value equivalence, Compound interest factors, Cash flow diagrams, Calculation, Calculation of time –value equivalences. Present worth comparisons, Comparisons of assets with equal, unequal and infinite lives, comparison of deferred investments, Future worth comparison, payback period comparison.

UNIT-II

Use and situations for equivalent annual worth comparison, Comparison of assets of equal and unequal life. Rate of return, Internal rate of return, comparison of IIR with other methods, IRR misconceptions.

UNIT-III

Analysis of public Projects: Benefit/ Cost analysis, quantification of project, cost and benefits, benefit/ cost applications, Cost –effectiveness analysis.

UNIT-IV

Depreciation, computing depreciation charges, after tax economic comparison, Break-even analysis; linear and non-linear models. Product and Process Costing, Standard Costing, cost estimation, Relevant Cost for decision making, Cost control and Cost reduction techniques.

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Course Title: **MOBILE COMPUTING**	Course Code: **DA6640**
Credit: **3**	L: **3** T: **0** P: **0**
Year: **4th**	Semester: **VI**

Unit I

Introduction: Introduction to mobile computing. Convergence of Internet, digital communication and computer networks. Sharing of wireless channels: FDMA, TDMA, CDMA. MAC layer issues in wireless communication

Unit II

Mobility Management: Impacts of mobility and portability in computational model and algorithms for mobile environment. Disconnected operation, handling handoffs. Analysis of algorithms and termination detection.Types of Mobility. Mobility in cellular based wireless network: channel allocation, interferences, handoffs and location management. IP mobility: Mobile IP and IDMP

Unit III

Wireless LAN: Infrared vs. Radio transmission, Infrastructure and Ad hoc Networks, IEEE 802.11: System architecture, Protocol architecture, Physical layer, Medium access control layer, MAC management, Future development; HIPERLAN: Protocol architecture, Physical layer, Channel access control.Sub layer, Medium access control Sub layer, Information bases and Networking; Bluetooth: User scenarios, Physical layer, MAC layer, Networking. Security, Link management. Personal Area Network: Bluetooth and ZigBee. Network layer issues ad hoc and sensor networks

Unit IV

Data Models: Data delivery models: push and pull. Data dissemination in wireless channels. Broadcast disks. Effects of caching,Indexing in Air, Mobile Databases and transaction

Unit V

Distributed Mobile Environment: Distributed file system for mobile environment, Mobile Middleware: Service discovery, adaptation, mobile agents.

Text Book:

1. Schiller, “Mobile Communications”, PHI/Pearson Education, Second Edition.
2. William Stallings, “Wireless Communications and Networks”, PHI/Pearson Education.

Reference Book:

1. T. Rappaport, "Wireless Communication: Principles and Practice", Pearson Education.
2. Reza B'Far (Ed), "Mobile Computing Principles", Cambridge University Press.

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Course Title**: DATA BASE ADMINISTRATION**	Course Code: **DA6650**
Credit: **3**	L T P **3 0 0**
Year: **4th**	Semester: **VI**

UNIT I Introduction

Oracle Architectural Components, Getting Started With Oracle Server , Managing an Oracle Instance, Creating a Database, Data Dictionary Contents and Usage, Maintaining the Control File, Redo Log Files, Managing Tablespaces and Data Files, Storage Structures and Relationships, Managing Undo Data, Tables, Indexes, Maintaining Data Integrity, Managing Password, Managing Security, Resources, users, Privileges & Roles, Loading Data Into a Database & Globalization Support

UNIT II DBA Fundamentals

Networking Overview, Basic Oracle Net Architecture, Server-Side Configuration, Basic Oracle Net Services Client-Side Configuration, Usage and Configuration of the Oracle Shared Server, Backup and Recovery Overview, Instance and Media Recovery Structures, Configuring the Database Archiving Mode, Oracle Recovery Manager Overview and Configuration, User Managed Backups, RMAN Backups, User Managed Complete & Incomplete Recovery, RMAN Complete Recovery, Incomplete Recovery & Maintenance, Recovery Catalog Creation and Maintenance, Transporting Data Between Databases

UNIT III Performance Tuning

Overview Of Oracle 9i Performance Tuning, Diagnostic and Tuning Tools, Sizing the Shared Pool & the Buffer Cache, Sizing The Other SGA Structures, Database Configuration and I/O Issues, Optimizing Sort Operations, Diagnosing Contention For Latches, Tuning Rollback Segments, Monitoring and Detecting Lock Contention, Tuning The Oracle Shared Server, Application Tuning, Using Oracle Blocks Efficiently SQL Statement Tuning, Tuning the OS and Using Resource Manager

UNIT IV Managing Oracle

Oracle10i: Overview, Preparing the Operating System & Install Oracle9i Software, Create a Custom Oracle Database, Install and Configure Enterprise Manager, Customize the Oracle Database Linux Measurement Tools, Oracle Measurement Tools, Tuning Oracle

UNIT V Database Troubleshooting

One Time Troubleshooting, Adhoc Troubleshooting, Escalations, Connectivity, Business Continuity, High Availability and Scalability, Data Sharing and information Integration

Text Book:

1. Oracle Database Administrator's Guide
2. Oracle DBA Handbook

Reference Book:

1. Michael Wessler Oracle DBA on Unix and Linux

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Course Title: **Genetic Algorithms & Probabilistic Reasoning**	Course Code: **DA6620**
Credit: **3**	L T P **3 0 0**
Year: **3rd**	Semester: **VI**

UNIT 1 **(8L)**

Fuzzy Sets (Introduction)

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory, Basic operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

UNIT2 **(8L)**

Fuzzy Logic (Fuzzy Membership, Rules)

Membership functions, Propositional logic and predicate logic, Inference in fuzzy logic, Fuzzy if-then rules, Fuzzy mapping rules, Fuzzy implications, Min-Max Theorem, Resolution Rule under Fuzzy environment, Refutation method for theorem proving, Defuzzifications,

UNIT3 **(8L)**

Reasoning with uncertain and incomplete information: The statistical approach to uncertainty, Introduction, Uncertain & incomplete knowledge. Review of Probability theory

UNIT4 **(8L)**

Bayes Theorem, Bayesian Networks, Bayesian reasoning. Decision Making, Joint Probabilities, Relationships, Polytrees., Dempster-Shafer theory of evidence, Certainty Factor, Non-monotonic systems.

UNIT 5 **(8L)**

Theoretical Foundation of Genetic Algorithms

Introduction: Basic Operators: Reproduction, Crossover & Mutation. Fitness function. Search Space, Schemas & Two-Armed and k-armed problem, Exact mathematical models, Applications of Genetic Algorithms.

Text Book:

1. G.J.Klir , Yuan,"Fuzzy Sets and fuzzy logic, Theory and applications", Prentice Hall India, 1995.
2. David E. Goldberg, "Genetic algorithms in search, optimization & Machine Learning" Pearson Education, 2006
3. Stuart Russel, Peter Norvig, "Artificial Intelligence A Modern Approach" Pearson (3rd Ed.)

Reference Book:

1. John Yen, Reza Langari, "Fuzzy Logic Intelligence, Control and Information", Pearson Education, 2006.
2. Timothy J Ross, "Fuzzy Logic with Engineering Applications", 2nd Edition, John Wiley, 2004.
3. H. Zimmermann, "Fuzzy Set Theory and its applications", 2nd Edition, Allied Publishers, 1996.
4. Melanle Mitchell, "An introduction to genetic algorithms", Prentice Hall India, 2002.

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cyber Security & Forensics
Batch: 2016-20

Course Title**: SECURITY INTELLIGENCE**			Course Code: **DM6210**
Credit: **4**	L	T	P
	3	**0**	**2**
Year: **4th**			Semester: **VI**

Course Objective:

The Security Intelligence Engineer career path prepares students to consolidate event logs from device endpoints within a network to identify threats. This will require skills in security intelligence such as data security, event offenses, asset profile offenses and event rules. The Security Intelligence Engineer will use tools to investigate offenses that are generated from network logs and create rules that will prevent them from happening further.

Unit 1: Cyber Security Overview

Identify latest technology trends and the IT security landscape, Explain the business and IT drivers that influence security-related business decisions, Define a comprehensive security solution portfolio to address the holistic IT security requirements in an organization, Illustrate the integration between security intelligence and other IT security domains, Describe how security intelligence can help detect and stop threats, Describe how security intelligence can help address organizational and regulatory compliance, Describe how a security intelligence solution can be integrated into an overall enterprise security architecture

Unit 2: Cyber Security Foundations

Explain and discuss the high level steps needed to design and implement a security intelligence solution, Describe the detailed activities needed to design and implement a security intelligence solution, Explain how to build a foundation through centralized security intelligence management, Explain the principles of designing and deploying a centralized and well-integrated security intelligence solution, Examine how data and information is exchanged within the system, Explain external threat intelligence feeds, Start a micro design for Windows, Create a re-useable list of audit controls, Use the common criteria security target document.

Unit 3: Security intelligence engineer

Explain the purpose of Security Intelligence Solution SIEM, Identify suspected attacks and policy breaches, Explain the capabilities of Security Intelligence Solution SIEM, Describe how Security Intelligence Solution SIEM collects and processes events and flows, Explain event collection and processing o Flow collection and processing, Describe how Security Intelligence Solution SIEM collects vulnerability data, Explain asset profiles o Explain active scanners, Navigate the Dashboard tab, Customize dashboards, Create a new custom dashboard, Add items to the new dashboard, Verify that the dashboard includes an offense item and two log event items.

Unit 4: Investigating an offense

Explain the concept of offenses, Investigate an offense, which includes this information o Summary information, The details of an offense, Respond to an offense, Identify the Offenses tab in Security Intelligence Solution SIEM, Identify the offense type and offense source and magnitude, Identify the number of events associated with the offense, List the event categories that contributed to this offense, Protect the offense and explain why, Use the list of events to navigate event details, Filter events included in an offense, Group events to gain different perspectives, Save a search that monitors a suspicious host, Modify a saved search, Add a search to the dashboard, Find the Local DNS Scanner containing invalid DNS offense, Show the low-level categories of the offense's events, Investigate the events associated with the offense, Create a filter to exclude the source IP that contributed to the Local DNS Scanner offense, Explain what do the results indicate, Look for similar DNS requests unrelated to the offense, Configure and verify the Save Criteria window and settings,

Save the current search criteria, Revisit or delete your saved search results, Find and run your saved search, Verify whether the log message that is displayed in the payload is a concern, Describe the purpose of an asset profile, Investigate asset profile details, Navigate from an offense to an asset o Assets tab and summary o Explain vulnerabilities, Find and group flows on the Network Activity tab, Investigate the summary of an offense that is triggered by flows, Investigate flow details, Tune false positives, Investigate super flows, Generate network traffic, Observe the network events and verify that a network event triggers an offense, Identify the offense name, type and source, Investigate flows related to the offense.

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Unit 5: Rules and Building Blocks

Describe rules and building blocks, Locate the rules that fired for events, flows, and offenses, Use the Rule Wizard to examine a rule action and response, Create an event rule to create offenses for login activity, Use a reference set to identify a class of objects, Review the Local DNS Scanner containing Invalid DNS, Describe the behavior that caused this rule to trigger, Explain how to change the rule behavior so that this source IP does not create an offense, Sort the Offense Count parameter is descending order, Identify what rule created most offenses, Identify how many events or flows are associated with a rule, Tune the Firewall Deny event as a false positive, Remove a testable object, Remove a limited number of rule changes, Revert a rule to the system default, Select Rules from the display list, Clear the Group filter, Search Rules, Navigate and use the Reports tab, Generate and view a report, Use the Report Wizard to create a custom report template, Show all reports, Identify what the report is generating, Identify the graph type and the parameters graphed, Clear the report filters, Choose the orientation layout, Verify that the container details are configured, Identify what the color background color of the container indicates, Explain what the Next Run Time column shows, Create a search for terminated user login activity, Create a terminated user login activity report, Apply advanced filters that locate specific events and flows, Use advanced search capabilities of the Ariel Query Language, Use time series and other charts to view data.

Learning Outcomes:

Having successfully completed this course, the student can:

1. Identify enterprise business and IT drivers that influence the overall IT Security Architecture
2. Define the role of a centralized Security Intelligence solution and how it integrates with other IT enterprise security components
3. Explain how a Security Intelligence solution can be used to investigate and stop advanced threats and address IT governance and regulatory compliance
4. Describe how QRadar SIEM collects data to detect suspicious activities
5. Navigate and customize the QRadar SIEM dashboard

Reference Book:

1. IBM COURSEWARE.

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cyber Security & Forensics
Batch: 2016-20

Course Title**: DISTRIBUTED COMPUTING**	Course Code: **DA7010**
Credit: **3.5**	L T P **3 1 0**
Year: **4th**	Semester: **VII**

Unit I : **Fundamentals of Distributed Computing:** Introduction to distributed computing Systems, Resource
sharing and the Web Challenges.
System Models: Architectural models, Fundamental Models
Theoretical Foundation for Distributed Computing System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks, Causal ordering of messages, global state, termination detection.

Unit II : **Distributed Mutual Exclusion**: Classification of distributed mutual exclusion, requirement of mutual
exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.
Distributed Deadlock Detection: system model, resource Vs communication deadlocks deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

Unit III : **Distributed Objects and Remote Invocation**: Communication between distributed objects, Remote
procedure call, Events and notifications, Java RMI case study.
Distributed File Systems: File service architecture, Sun Network File System, The Andrew File System, Recent advances.

Unit IV : **Transactions and Concurrency Control**: Flat and nested distributed transactions, Locks, Optimistic Concurrency
control, Timestamp ordering, Comparison of methods for concurrency control.
Distributed Transactions: Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Atomic Commit protocols.

Unit V : **Introduction to Grid Computing:** Basics of grid Computing, Benefits of grid computing, Grid terms and concepts,
Grid user roles, Standards for grid environments, Grid security requirements.
Introduction to Parallel Processing: Basic Concepts: Introduction to parallel processing, parallel processing terminology, Parallel & Distributed Programming: Parallel Programming environments

Text Book:

1. Tannenbaum, A, Van Steen. Distributed Systems, Principles and Paradigm , Prentice Hall India, 2002
2. Tannenbaum, A. Distributed Operating Systems, Pearson Education. 2006

Reference Book:

1. Attiya, Welch, "Distributed Computing", Wiley India, 2006
2. Singhal and Shivaratri, "Advanced Concepts in Operating Systems", McGraw Hill, 1994
3. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Ed.

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cyber Security & Forensics
Batch: 2016-20

Course Title: **ADVANCED COMPUTER ARCHETECTURE**	Course Code: **DA7020**
Credit: **3.5**	L T P **3 1 0**
Year: **4th**	Semester: **VII**

UNIT 1 ***(6L)***

Introduction: Parallel Computing, Parallel Computer Model, Program and Network Properties, Parallel (Architectural Classification Schemes, Flynn's & Feng's Classification, Performance Metrics and Measures, Speedup Performance Laws: Multiprocessor System and Interconnection Networks; IEEE POSIX Threads: Creating and Exiting Threads, Simultaneous Execution of Threads, Thread Synchronization using Semaphore and Mutex, Canceling the Threads.

UNIT 2 ***(9L)***

Pipelining and Memory Hierarchy: Basic and Intermediate Concepts, Instruction Set Principle; ILP: Basics, Exploiting ILP, Limits on ILP; Linear and Nonlinear Pipeline Processors; Super Scalar and Super Pipeline Design; Memory Hierarchy Design: Advanced Optimization of Cache Performance, Memory Technology and Optimization, Cache Coherence and Synchronization Mechanisms.

UNIT 3 ***(8L)***

Thread and Process Level Parallel Architecture: Introduction to MIMD Architecture, Multithreaded Architectures, Distributed Memory MIMD Architectures, Shared Memory MIMD Architecture, Clustering, Instruction Level Data Parallel Architecture, SIMD Architecture, Fine Grained and Coarse Grained SIMD Architecture, Associative and Neural Architecture, Data Parallel Pipelined and Systolic Architectures, Vector Architectures.

UNIT 4 ***(8L)***

Parallel Computing model: Sequential model, need of alternative model, parallel computational models such as PRAM, LMCC, Hypercube, Cube Connected Cycle, Butterfly, Perfect Shuffle Computers, Tree model, Pyramid model, Fully Connected model, PRAM-CREW, EREW Models.

UNIT 5 ***(9L)***

Parallel Algorithms: PRAM Algorithms: Parallel Reduction, Prefix Sums, Preorder Tree Traversal, Merging two Sorted lists; Matrix Multiplication: Row Column Oriented Algorithms, Block Oriented Algorithms; Parallel Quicksort, Hyper Quicksort; Solving Linear Systems: Gaussian Elimination, Jacobi Algorithm; Parallel Algorithm Design Strategies.

Text Book:

1. Kai Hwang," Advance Computer Architecture", TMH
2. Matthew, "Beginning Linux Programming", SPD/WROX

Reference Book:

1. Hennessy and Patterson," Computer Architecture: A Quantitative Approach", Elsevier
2. Dezso and Sima, "Advanced Computer Architecture", Pearson
3. Quinn, "Parallel Computing: Theory & Practice", TMH
4. Quinn, "Parallel Programming in C with MPI and Open MP", TMH

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cyber Security & Forensics
Batch: 2016-20

Course Title: **CRYPTOGRAPHY AND NETWORK SECURITY**	Course Code: **DA7210**
Credit: **4**	L: **3** T: **0** P: **2**
Year: **4th**	Semester: **VII**

Unit I : Introduction to security attacks, services and mechanism, introduction to cryptography.

Conventional Encryption: Conventional encryption model, classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography,stream and block ciphers.

Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard(DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES, confidentiality using conventional encryption, traffic confidentiality, key distribution

Unit II : Introduction to prime and relative prime numbers, finite field of the form GF(p), modular arithmetic, Fermat's and Euler's theorem, primarily testing, Euclid's Algorithm, Chinese Remainder theorem, Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffie-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elgamel encryption.

Unit III : **Message Authentication and Hash Function:** Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm(SHA).Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm.

Unit IV : **Authentication Applications:** Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), S/MIME.

Unit V : **IP Security:** Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

Web Security: Secure socket layer and transport layer security, secure electronic transaction (SET).

System Security: Intruders, Viruses and related threads, firewall design principals, trusted systems.

Text Book:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Prentice Hall, New Jersy.

Reference Book:

1. Johannes A. Buchmann, "Introduction to Cryptography", Springer-Verlag.
2. Bruce Schiener, "Applied Cryptography".

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cyber Security & Forensics
Batch: 2016-20

Course Title: **DATAWAREHOUSE & DATA MINING**	Course Code: **DA7030**
Credit: **3.5**	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VII**

Unit I : Overview, Motivation (for Data Mining), Data Mining-Definition & Functionalities.

Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting. ROLAP, MOLAP, HOLAP.

Unit II : **Data Pre-Processing**: Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Inconsistent Data, Data Integration and Transformation.

Data Reduction: Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation.

Unit III : **Concept Description:** Definition, Data Generalization, Analytical Characterization,

Analysis of attribute relevance, Mining Class comparisions, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases

Unit IV : **Classification:** What is Classification, Issues regarding Classification, Decision tree, Bayesian Classification, Classification by Back propagation.

Unit V : **Cluster Analysis:** Data types in cluster analysis, Partitioning methods. Hierarchical Clustering-CURE and Chameleon, Density Based Methods-DBSCAN, OPTICS, Grid Based Methods- STING, CLIQUE, Outlier Analysis

Text Book:

1. Jiawei Han, Micheline Kamber, "Data Mining Concepts & Techniques" Elsevier

Reference Book:

1. M.H.Dunham,"Data Mining:Introductory and Advanced Topics" Pearson Education
Mallach,"Data Warehousing System",McGraw –Hill

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cyber Security & Forensics
Batch: 2016-20

Course Title**: BLOCKCHAIN**			Course Code: **DK8210**
Credit: **4**	L **3**	T **0**	P **2**
Year: **4th**			Semester: **VII**

Course Objective:

The BlockChain career path prepares students to apply BlockChain in real-life. This will require skills in businesses exchange value with suppliers, partners, customers and others. Exchange of value is a transaction. Blockchain for business provides a way to execute many more of these transactions—a much better way.

Unit 1 Blockchain Introduction:

To introduce the content, learning objectives, and learning outcomes, To remind students of pre-requisite knowledge and/or pre-work, To provide an introduction to BlockChain with emphasis on key concepts, To introduce use cases from different industries, An overview of BlockChain key concepts and their domain of application in different industries,

Applying BlockChain concepts: To apply key BlockChain concepts on a particular given use case, An exercise on applying BlockChain concepts on a selected use case to identify assets, participants, and transactions. The use case is for the sample application that is used for the rest of the lab exercises.

Unit 2: Understanding Hyper ledger Composer & BlockChain solution architecture

To introduce Hyperledger Composer, To introduce the Hyperledger Composer Playground GUI, An exercise

on using the Vehicle Manufacturing lifecylce project on Hyperledger Composer to implement the sample application and deploy it. Additionally, build a transaction and adding new participants.

Using Hyperledger Composer: To obtain hands-on knowledge of Hyperledger Composer including the Playground, An exercise on using Hyperledger Composer to implement the sample application and deploy it**., T**o understand the different components of Blockchain, To understand the architecture of a typical Blockchain solution, A closer look at Hyperledger Fabric and a typical Blockchain solution Architecture. Additionally, linkage to IoT and other technologies, **Exploring sample Blockchain application:** To deploy and explore a complete Blockchain sample and understand its different parts, To modify the artifacts of the sample (assets, participants, transactions), An exercise to explore the different parts of the sample application to highlight the different artifacts in design and runtime, Peer, certificate authority, ordering services, database, Docker image.

Unit 3: Blockchain deep dive

To understand network consensus, To understand Channels and Ordering Service, An explanation of how consensus works, how endorsements work, and ordering in the way Hyperledger Fabric operates, **Blockchain Composer Node.JS :** To modify and deploy the front-end application of the sample application, An exercise on developing and deploying a front end client application that consumes APIs exposed by Hyperledger Composer on the previous exercise, To understand business network setup, To understand Endorsement Policies, To understand pluggable world-state, A description of the elements of a business network, role of channels, and how world state is maintained, **Building Hyperledger Fabric business network :** To apply Hyperledger Fabric network concepts, A exercise on building a Hyperledger Fabric business network to deploy the sample application.

Unit 4: Understanding Hyperledger Fabric application development and blockchain deployment:

To introduce Hyperledger Fabric chaincode development, A closer look at chaincode development for Hyperledger Fabric,**Developing chaincode for Hyperledger Fabric :** To practice chaincode development for Hyperledger Fabric, An exercise on writing and deploying chaincode, To understand the different delivery options for Blockchain, A description of the different possible deployment options of Blockchain solutions including local, on IBM Container Service, and IBM Blockchain Platform, **Developing client app for Hyperledger Fabric:** To practice client app development for Hyperledger Fabric, An exercise on developing front end application for Hyperledger Fabric, and deploying the service, **Understanding Blockchain security:** To understand Hyperledger Fabric security including permissioned ledger access, To understand Hyperledger Composer security, A description of Hyperledger Composer and Hyperledger Fabric security.

Unit 5 : Securing a Blockchain application and integration options

To practice Hyperledger security concepts on the sample application, A description exercise on applying security concepts and access control to the sample application. The importance of GDPR, Learning Objectives:To understand the different integration options between Hyperledger and other systems, An exploration of the different integration options of Hyperledger Fabric, **Integrating Hyperledger with other systems:** To practice the integration topic with an example, An exercise on applying integration options to the sample application. Apply a node-red component on the front-end. Look at the REST APIs, triggering events, non-deterministic problems, etc…

Learning Outcomes:

Having successfully completed this course, the student can:

1. Blockchain Developer overview
2. What is Hyperledger Fabric
3. What is Hyperledger Composer
4. Simplifying BlockChain implementation
5. Applying BlockChain concepts
6. Hyperledger Composer capabilities

Reference Book:

1. IBM COURSEWARE.

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cyber Security & Forensics
Batch: 2016-20

Course Title**: PREDICTIVE ANALYSIS MODELER**	Course Code: **DL7210**
Credit: **4**	L **3** T **0** P **2**
Year: **4th**	Semester: **VII**

Course Objective:

The Predictive Analytics Modeler career path prepares students to learn the essential analytics models to collect and analyze data efficiently. This will require skills in predictive analytics models, such as data mining, data collection and integration, nodes, and statistical analysis. The Predictive Analytics Modeler will use tools for market research and data mining in order to predict problems and improve outcomes.

Unit 1 – Business Analytics Overview

Understand how analytics is transforming the world, Understand the profound impact of analytics in business decisions, Understand what is analytics and how it works, Understand why business analytics has become important in various industries, Understand the history of analytics and how it has changed today, Understand how to analyze unstructured data , Understand how analytics is making the world smarter, Understand where the future of analytics lies, Explain why successful enterprises need business analytics, Understand how business analytics can help turn data into insight, Understand how predictive analytics is transforming all types of organizations, Explain how analytics supports retail companies, Understand how analytics can reduce crime rates and accidents, Explain the use of analytics in law enforcement and insurance companies, Understand how analytics can affect the future of education, Understand the importance of business analytics, Comprehend how big data and analytics can help in understanding consumer/customer behavior, Explain how analytics can help manage assets, Understand how analytics can help combat fraud ,Explain how analytics can help us to understand social sentiments, Explain what is analytics , Define various types of analytics, Demonstrate how to apply analytics, Describe business intelligence ,Demonstrate how to apply business intelligence

Unit 2: Introduction to a Predictive Analytics Platform & Data Mining

List two applications of data mining, Explain the stages of the CRISP-DM process model ,Describe successful data-mining projects and the reasons why projects fail, Describe the skills needed for data mining, Understand data mining , Describe how to apply data mining in different scenarios, Describe the MODELER user-interface , Work with nodes , Run a stream or a part of a stream ,Open and save a stream ,Use the online Help, Create streams , Change streams, Generate a select node from the Table output, Create a stream that reads data and exports data to Microsoft Excel, Change and save a stream., Create a new stream from an existing stream, Make a stream neat using a SuperNode, Explain the basic framework of a data-mining project, Build a model , Deploy a model, Build a model using historical data, Deploy the model, Explore the data, Select modeling data , Build a CHAID model, Interpret of the fields added by model nugget, Explore the results, Explain the concepts of data structure, unit of analysis, field storage and field measurement level, Import Microsoft Excel files , Import text files Import from databases , Export data to various formats, Import a Microsoft Excel file , Import a text file , Set fields' measurement levels, Import data

Determine the unit of analysis , Determine relationships between datasets ,Set measurement levels, Audit the data , Explain how to check for invalid values , Take action for invalid values , Explain how to define blanks, Audit the data ,Define valid values and take action , Declare blank values, Explore the data , Set ranges and take action , Declare blanks, Set the unit of analysis by removing duplicate records, Set the unit of analysis by aggregating records , Set the unit of analysis by expanding a categorical field into a series of flag fields, Cleanse data by removing duplicate records , Expand a categorical field into a series of flag fields, Remove duplicate records , Create a dataset where customers are unique in a company's purchases data ,Create a dataset where customers are unique in a company's order lines data , Create a dataset where customers are unique in a company's mailing history data, Integrate data by appending records from multiple datasets , Integrate data by merging fields from multiple datasets , Sample records, Append records from two datasets, Merge fields from different datasets, Enrich a dataset with aggregated data , Sample records

Create single datasets, Enrich the data with zipcode information, Export a random sample, Use the Control Language for Expression Manipulation (CLEM), Derive new fields, Reclassify field values, Cleanse data and derive fields for modeling, Cleanse data and reclassify fields for modeling, Compute the difference between amount spent and credit limit , Compute fields in a currency from a different currency, Create a segment field

Create a field returning the bonus, Examine the relationship between two categorical fields, Examine the relationship between a categorical field and a continuous field, Examine the relationship between two continuous fields, Assess the relationship between churn and handset , Assess the relationship between churn and number of dropped calls , Assess the relationship between number of products and revenues, Examine the relationship between response and other factors in the dataset, List three modeling objectives Use a classification model , Use a segmentation model, Predict churn by running a CHAID model ,Predict churn by running a Neural Net model , Compare the accuracy of these models, Find groups of similar customers, based on usage, Build a CHAID model to predict response, Assess the model's accuracy , Apply the model to other customers, Use the two step segmentation model to cluster records.

Unit 3: Advanced data preparation

Use date functions , Use conversion functions , Use string functions , Use statistical functions , Use missing value functions, Use the date functions to derive fields , Use string functions to derive fields, Use statistical functions to derive fields, Use missing value functions to derive fields, Import and instantiate the data ,Compute an AGE field , Conditionally compute the sum over a series of fields, Derive a field taking blank values into account, Use the Filler node to replace values, Use the Binning node to recode continuous fields Use the Transform node to change a field's distribution, Use the Filler node to change storage , Use the Filler node to replace null values , Use the Filler node to replace strings , Do binning with equal counts, Do binning using a supervisor field, Import and instantiate the data , Correct spelling, Replace blanks with undefined values , Bin a field optimally with respect to target , Transform a field to change its distribution, Use cross-record functions , Use the Count mode in the Derive node Use the Restructure node to expand a continuous field into a series of continuous fields, Use the Space-Time-Boxes node to work with geospatial and time data

Create a record identifier , Move an average , Restructure a transactional dataset, Use the Space-Time-Boxes node, Import the data Derive a record identifier , Restructure the dataset , Analyze geospatial and time data

Use the Sample node to draw simple and complex samples , Partition the data into a training and a testing set, Reduce or boost the number of records, Draw a simple sample and a complex sample , Partition data into a training set and a testing set, Balance the data, Import the data, instantiate the data and examine the response , Draw a random sample, Draw a stratified sample , Prepare for modeling by using a Type node, Run models on the training set and select the best model, Use database scalability by SQL pushback, Use the Data Audit node to process outliers and missing values, Use the Set Globals node, Use parameters , Use looping and conditional execution, Use the Data Audit node to process outliers, extremes and missing values, Compute standardized scores using globals, Use parameters , Create a loop through values, Import and instantiate the data, Use globals to replace undefined values with the mean , Create a loop through the row fields in the Matrix node

Unit 4: Automated Data Mining:

Describe the featured included with modeler to automate data mining, Describe the phases of the CRISP-DM process model for data mining, Use the modeler interface , Describe the components of the modeler user interface , Place nodes on the stream canvas , Connect and disconnect nodes, Edit and rename codes, Create nodes , Create streams, Read a statistics data file into modeler , Use a statistics file node to read a statistics data file , Use the filter tab to filter and rename fields , Use the types tab to view measurement level and set field role , Save a modeler stream file, Read a data file, Type the data in the source node, Review and explore data to look at data distributions , Identify data problems, including missing values , Describe the types of missing values for fields , Set missing values for fields, Use the data audit node to explore data distributions, Use the data audit node to impute missing data , Use the table node to view the data file, Edit the source node, Identify what types of blank values are defined for fields , Add a data audit node to the stead, Review missing values, Use the automated data prep node to further prepare data modeling , Use the type node to set characteristics for fields , Describe the various features and capabilities of the automated data prep node Use settings of the automated data prep node that are appropriate for the data and modeling objectives, Describe

the types of output produced by the automated data prep node, Add an ADP node to the stream, Edit the ADP node, Run analysis on the ADP node.

Unit 5: Data Partitioning and Deploying Models

Use a partition node to create training and testing data subsets, Describe rationale and use of a partition node to create data subsets , Set sizes of the training and testing partitions and other partition characteristics , Use a distribution node to view the distribution of a categorical field, Use a partition node to create training and testing data subsets , Describe rationale and use of a partition node to create data subsets , Set sizes of the training and testing partitions , Use a distribution node to view the distribution of a categorical field, Use the feature selection node to select inputs for modeling , Describe the features and settings of the feature selection node , Describe the model output from feature selection, Generate a filter node to use the selected fields, Use the feature selection node to select fields, Predict a response, Describe the features and settings of the auto classifier node , Describe and use the components of the model output from the auto classifier node, Use the auto classifier node to construct a model in order to predict a response, Use the analysis mode to get a summary of predictions, Use the select node to analyze the testing partition data, Use a matrix node to examine the percent accuracy of predictions, Use a distribution node to graphically display the relationship between a categorical prediction and the target , Use a histogram node to graphically display the relationship between a continuous predictor and the target., Use an analysis node to evaluate model predictions, Use a distribution node to evaluate model predictions, Use a histogram node to evaluate model predictions, Describe and use the features of the auto numeric node , Describe and use the components of the model output from the auto numeric node, Use various nodes for model evaluation Add an auto numeric node to the stream, Use an analysis node to evaluate the auto numeric model, Describe what needs to be modified to create a scoring stream for new data , Describe the deployment options in modeler , Export scored data to another file format, Use a scoring stream to make predictions.

Learning Outcomes:

Having successfully completed this course, the student can:

1. The importance of analytics and how its transforming the world today
2. Understand how analytics provided a solution to industries using real case studies
3. Explain what is analytics, the various types of analytics, and how to apply it
4. Improve efficiency, sample records, and work with sequence data
5. Explain data transformations, and functions

Reference Book:

1. IBM COURSEWARE.

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cyber Security & Forensics
Batch: 2016-20

Course Title**: ADVANCED RDBMS**		Course Code: **DK7250**
Credit: **4**	L **3**	T **0**	P **2**
Year: **4th**		Semester: **VII**

Unit I **(8 L)**

RDBMS: Entity –Relationship model – Relational Model – Relational constraints- Relational algebra ,Tuples and Domain Relational calculus, Database Administrator, Introduction to SQL, Data Definition Language, Data Manipulation Language, Data Control Language, Queries, Join, Functions, Operators, Invoking SQL *Plus, Commit, Rollback, Normal forms, ER Diagram, mapping.

Unit II **(8 L)**

Introduction to Pl/SQL, Control Statements, View, Indexes, Sequences, PL/SQL Cursor, Database Trigger, Function, Procedure, Exceptional Handling in Oracle 11i**.**

Unit III **(7 L)**

Query processing and optimization-Transactions-Properties of Transactions-Concurrency Control, Recovery, Security and Authorization, Storage-Indexing and Hashing, B+ Trees, Trees-X Trees, Dynamic Hashing .

Distributed Databases-Principles –Design-Queries Translation of queries optimization Access Strategies, Management of Distributed Transactions actions-concurrency Control-Reliability .

Unit IV **(7 L)**

Object Oriented Concepts-Data Object Models-Object Based Databases –Object Oriented Databases-Object Oriented Databases Relational Databases-Object Definition Languages-Object Query Languages-SQL3-Concurreency in OODBs-Storage and Access Data Access .

Unit V **(6 L)**

Other Database Models-Multimedia Databases-Parallel Databases Data Mining - Data Warehousing –Spatial Databases Concepts –Temporal Databases Concepts-Active Databases.

Text Book:

1. Fred R. McFadden, Jeffery A. Hoffer, Mary B. ,Modern Database Management, Prescott, Fifth Edition , Edition Wesley, 2000 .
2. Elmasri, Navathe, ,Fundamentals Of Database Systems, Third Edition,Addison Wesley, 2000 .
3. Abraham Silberchartz, Henry F. Korth, S. Sudarshan, Database System Concepts ,Third Edition, McGraw-Hill, 1996 .

Reference Book:

1. Jefry D. Ullman , Jenifer Widom ,A First Course in Database Systems, Pearson Education Asia, 2001 .
2. Stefano Ceri, Giuseppe Pelagatti, Distributed Databases Principles & Systems, McGraw-Hill International Editions, 1985
3. Rajesh Narang, Object Oriented Interfaces & Databases, Prentice Hall Of India, 2002 .

Department of Computer Science & Engineering
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Batch: 2016-20

Course Title**: BUSINESS INTELLIGENCE**	Course Code: **DA8010**
Credit: **3.5**	L T P **3 1 0**
Year: **4th**	Semester: **VIII**

Unit I

Introduction to Business Intelligence,

Introduction to OLTP and OLAP, BI Definitions & Concepts, Business Applications of BI, BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities

Unit II

Basics of Data Integration (**E**xtraction **T**ransformation **L**oading)**,**

Concepts of data integration need and advantages of using data integration, introduction to common data integration approaches, introduction to ETL using SSIS, Introduction to data quality, data profiling concepts and application

Unit III

Introduction to Multi-Dimensional Data Modeling**,**

Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi dimensional modeling, concepts of dimensions, facts, cubes, attribute, hierarchies,

Unit IV

Star and snowflake schema, introduction to business metrics and KPIs, creating cubes using SSAS

Unit V

Basics of Enterprise Reporting**,**

Introduction to enterprise reporting, concepts of dashboards, balanced scorecards, introduction to SSRS Architecture, enterprise reporting using SSRS

Text Book:

1. David Loshin ,Business Intelligence.
2. Mike Biere ,Business intelligence for the enterprise .
3. Larissa Terpeluk Moss, Shaku Atre ,Business intelligence roadmap.

Reference Book:

1. Cindi Howson ,Successful Business Intelligence: Secrets to making Killer BI Applications .
2. Brain, Larson ,Delivering business intelligence with Microsoft SQL server 2008 .

Department of Computer Science & Engineering
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Batch: 2016-20

Course Title**: REAL TIME SYSTEMS**	Course Code: **DA8040**
Credit: **3.5**	L T P **3 1 0**
Year: **4th**	Semester: **VIII**

UNIT-I: Introduction
Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

UNIT-II: Real Time Scheduling
Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III: Resources Access Control
Effect of Resource Contention and Resource Access Control (RAC), Nonpreemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

UNIT-IV: Real Time Communication
Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols

UNIT-V: Real Time Operating Systems and Databases
Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases

Text Book:

1. Jane W. S. Liu, "Real Time Systems", Pearson Education Publication.
2. Albert M. K. Cheng, "Real-Time Systems: Scheduling, Analysis, and Verification ,John Wiley and Sons Publications.

Reference Book:

1. Mall Rajib," Real Time Systems" Pearson Education

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Course Title**: CYBER LAW & IPR**	Course Code: **DA8050**
Credit: **3**	L T P **3 0 0**
Year: **4th**	Semester: **VIII**

UNIT I - FUNDAMENTALS OF CYBER SECURITY

Introduction-Cyber Security and its problem-Intervention Strategies: Redundancy, Diversity and Autarchy.

UNIT II – ISSUES IN CYBER SECURITY

Private ordering solutions, Regulation and Jurisdiction for global Cyber security, Copy Right-source of risks, Pirates, Internet Infringement, Fair Use, postings, criminal liability, First Amendments, Data Loss.

UNIT III – INTELLECTUAL PROPERTY RIGHTS

Copy Right-Source of risks, Pirates, Internet Infringement, Fair Use, postings, Criminal Liability, First Amendments, Losing Data, Trademarks, Defamation, Privacy-Common Law Privacy, Constitutional law, Federal Statutes, Anonymity, Technology expanding privacy rights.

UNIT IV - PROCEDURAL ISSUES

Duty of Care, Criminal Liability, Procedural issues, Electronic Contracts & Digital Signatures, Misappropriation of information, Civil Rights, Tax, Evidence.

UNIT V-LEGAL ASPECTS OF CYBER SECURITY

Ethics, Legal Developments, Late 1990 to 2000,Cyber security in Society, Security in cyber laws case. studies, General law and Cyber Law-a Swift Analysis.

Text Book:

1. Jonathan Rosenoer,*"Cyber Law: The law of the Internet"*, Springer-Verlag,1997.

Reference Book:

1. Mark F Grady, Fransesco Parisi, "*The Law and Economics of Cyber Security"*, Cambridge University Press, 2006.

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Course Title**: DIGITAL IMAGE PROCESSING**	Course Code: **DA7640**
Credit: **4**	L **3** T **0** P **2**
Year: **4th**	Semester: **VII**

Unit I : **Introduction and Fundamentals:** Motivation and Perspective, Applications, Components of Image Processing
System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.
Image Enhancement in Spatial Domain: Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

Unit II : **Image Enhancement in Frequency Domain:** Fourier Transform and the Frequency Domain, Basis of Filtering in
Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.
Image Restoration: A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

Unit III : **Color Image Processing:** Color Fundamentals, Color Models, Converting Colors to different models, Color Transformation, Smoothing and Sharpening, Color Segmentation.
Morphological Image Processing: Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening.

Unit IV : **Registration:** Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms
to Establish Correspondence, Algorithms to Recover Depth
Segmentation: Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Regionbased Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

Unit V : **Feature Extraction:** Representation, Topological Attributes, Geometric Attributes.
Description: Boundary-based Description, Region-based Description, Relationship.
Object Recognition: Deterministic Methods, Clustering, Statistical Classification, Syntactic Recognition, Tree Search, Graph Matching.

Text Book:

Rafael C. Gonzalvez and Richard E.Woods., Digital Image Processing 2nd Edition, Pearson Education.
2. R.J. Schalkoff. ,Digital Image Processing and Computer Vision, John Wiley and Sons, NY.

Reference Book:

1. A.K. Jain. , Fundamentals of Digital Image Processing, Prentice Hall, Upper Saddle River, NJ.

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Batch: 2016-20

Course Title**: ADVANCED COMPUTER NETWORK**	Course Code: **DA7650**
Credit: **4**	L **3** T **0** P **2**
Year: **4th**	Semester: **VII**

UNIT I ***(8L)***

Network Design: Design Principles, Determining Requirements, Analysing the Existing Network, Preparing the Preliminary Design, Completing the Final Design Development, Deploying the Network, Monitoring and Redesigning, Maintaining, Design Documentation, Cisco PDIOO Model, Modular Network Design, Hierarchical Network Design, The Cisco Enterprise Composite Network Model.

UNIT II ***(8L)***

Router Design: Configuring a Router, Routing Protocols, **Switching Design**: Switching Types, Layer 2 and 3 Switching, Multilayer Switching, Cisco Express Forwarding, Switching Security, Multi-Protocol Label Switching (MPLS), MPLS Architecture and related protocols. **IPv4 Routing Design**: IPv4 Address Design, Private and Public Addresses ,NAT, Subnet Masks, Hierarchical IP Address Design, Deploying IPv6 in Campus Networks,

UNIT III ***(8L)***

Wireless LAN Design: Wireless Technology Overview, Wireless Standards, Wireless Components, Wireless Security, Wireless Security Issues, Wireless Threat Mitigation, Wireless Management, Wireless Design Considerations, IEEE 802.11, Wireless Standard, Cellular Networks, Mobile IP, Wireless Mesh Networks(WMNs), QoS Models: IntServ, DiffServ154, QoS Tools, Policing and Shaping, Congestion Avoidance, Congestion Management, Link- Specific Tools, QoS Design Guidelines.

UNIT IV ***(8L)***

Optical Networks: Benefits of Optical Networks, Optical Network Drivers, Component Applications, Design and Planning, Restoration, Network Management, WDM System, All-Optical Network, Optical Layer Services and Interfacing.

UNIT V ***(8L)***

Network Security and Management Design: Hacking: Vulnerabilities, Threats: Reconnaissance Attacks, Access Attacks, Information Disclosure Attacks, Denial of Service Attacks, Threat Defence Secure Communication, Network Security Best Practices, SAFE Campus Design.

ISO Network Management Standard: Protocols and Tools, SNMP, MIB, RMON, Cisco NetFlow, Syslog, Network Management Strategy: SLCs and SLAs, IP Service-Level Agreements, Content Networking Design.

Text Book:

1. Diane Tiare and Catherine Paquet, "Campus Network Design Fundamentals", Pearson Education, 2006.
2. Rajiv Ramaswami, Kumar N Sivarajan, Galen H Sasaki, "Optical Networks, A Practical Perspective", 3rd Edition, Elsevier, 2010.

Reference Book:

1. Craig Zacker, "The Complete Reference: Upgrading and Troubleshooting Networks", Tata McGraw-Hill, 2000.

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Batch: 2016-20

Course Title: **STATISTICAL MACHINE LEARNING**	Course Code: **DA7670**
Credit: **4**	L: **3** T: **0** P: **2**
Year: **4th**	Semester: **VII**

Unit I **Introduction:** Probability Theory, Overview of supervised learning, Curse of dimensionality, Decision theory, Information theory, Minimax theory, Parametric versus non-Parametric methods, Bayesian versus non-Bayesian approaches, Classification, Regression, Density estimation, Bias-variance, Lasso, MLE.

Unit II **Parametric and Nonparametric Methods:** Linear regression, Model selection, Generalized linear models, Classification, Structured prediction, Hidden Markov models; Regression: Linear smoothers, Variance estimations, Confidence bands, Average coverage, Space-scale smoothing, Multiple regression; Density estimation: Cross-validation, Histograms, Kernel density estimation, Local polynomials, Classification, Bootstrap and sub-sampling, Nonparametric Bayes.

Unit III **Kernel Methods and Machines:** Dual representations, Kernel construction, Selecting the width of the kernel, Kernel density estimation and classification, Radial basis functions and kernel, Gaussian processes, Maximum margin classifiers, Relevance vector machines.

Unit IV **Graphical and Mixture Models:** Bayesian networks: Generative models, Linear-Gaussian models; Conditional independence: D-separation; Markov random fields: Factorization properties, Relation to directed graphs; Inference in graphical models: Inference on a chain, Trees, Factor graphs, Sum-product & max-sum properties, Loopy belief propagation; K-means clustering, Mixtures of Gaussians, EM, An alternative view of EM.

Unit V **Other Learning Methods:** Unsupervised learning, Semi-supervised learning, Reinforcement learning, Ensemble learning, Online learning, Active learning.

Text Book

1. Bishop C. M., Pattern Recognition and Machine Learning, Springer (2006), 1st ed.
2. Hastie T., Tibshirani R., Friedman J., The Elements of Statistical Learning, Springer (2008), 2nd ed.

Reference Book

1. Wasserman L., All of Statistics: A Concise Course in Statistical Inference, Springer (2010), 1st ed.
2. Devroye L., Gyorfi L., Lugosi G., A Probabilistic Theory of Pattern Recognition, Springer, (1996), 1st ed.

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Course Title**: COMPUTER VISION**		Course Code: **DA8630**
Credit: **3**	L **3**	T **0**	P **0**
Year: **4th**		Semester: **VIII**

Unit I

Introduction: What is computer vision, The Marr paradigm and scene reconstruction, Other paradigms for image analysis. Image Formation, Image Geometry, Radiometry, Digitization.

Unit II

Binary Image Analysis and Segmentation: Properties, Digital Geometry, Segmentation.

Unit III

Image Processing for Feature Detection and Image Synthesis, Edge detection, corner detection Line and curve detection, SIFT operator, Image-based modelling and rendering, Mosaics, snakes.

Unit IV

Stereo: Shape from shading, Photometric stereo, Texture, Occluding contour detection, Motion Analysis: Motion detection and optical flow Structure from motion

Unit V

Object recognition: Hough transforms and other simple object recognition methods, Shape correspondence and shape matching ,Principal component analysis ,Shape priors for recognition

Text Book:

1. D. Forsyth and J. Ponce, *Computer Vision - A modern approach,* Prentice Hall *Robot Vision,* by B. K. P. Horn, McGraw-Hill.

Reference Book:

1. E. Trucco and A. Verri ,*Introductory Techniques for 3D Computer Vision,* Publisher: Prentice Hall

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Batch: 2016-20

Course Title**: SOFTWARE TESTING**		Course Code: **DA8650**
Credit: **3**	L **3**	T **0**	P **0**
Year: **4th**		Semester: **VIII**

Unit I **(8 L)**

Introduction: Terminology, evolving nature of area, Errors, Faults and Failures, Correctness and reliability, Testing and debugging, Static and dynamic testing, Exhaustive testing: Theoretical foundations: impracticality of testing all data, impracticality of testing all paths, no absolute proof of correctness.

Unit II **(8 L)**

Software V & V Approaches and their Applicability: Software technical reviews; Testing techniques and their applicability -functional testing and analysis, structural testing and analysis, error-oriented testing and analysis, hybrid approaches, integration strategies, transaction flow analysis, stress analysis, failure analysis, concurrency analysis, performance analysis; Proof of correctness; simulation and prototyping; Requirement tracing.

Unit III **(8 L)**

Software Testing: Levels of Testing, Functional Testing, Structural Testing, Test Plan, Test Case Specification, Software Testing Strategies, Verification & Validation, Unit, Integration Testing, Top Down and Bottom Up Integration Testing, Regression and Stress Testing , Alpha & Beta Testing, White box and black box testing techniques, System Testing and Debugging.

Unit IV **(8 L)**

Test Generation: Test generations from requirements, Test generation pats, Data flow analysis, Finite State Machines models for flow analysis, Regular expressions based testing, Test Selection, Minimizations and Prioritization, Regression Testing.

Unit V **(8 L)**

Program Mutation Testing: Introduction, Mutation and mutants, Mutation operators, Equivalent mutants, Fault detection using mutants, Types of mutants, Mutation operators for C and Java.

Text Book:

1. Boris Beizer, Software Testing Techniques, John Wiley & Dreamtech (2002).
2. William Perry, Effective Methods for Software Testing, John Wiley & Sons, Inc. (2006) 3rd ed.
3. Aditya P. Mathur, Foundations of Software Testing, Pearson Education (2008).

Reference Book:

1. Glenford J. Myers, The Art of Software Testing, Wiley India Pvt. Ltd 2nd edition (2006) 2nd ed.
2. Roger S. Pressman, Software Engineering, A Practitioner's Approach, McGrawHill International Edition (2009) 7th edition.
3. Ian Sommerville, Software Engineering, Addison-Wesley Publishing Company, (2006) 8th ed.

Department of Computer Science & Engineering
B.Tech. (CSE) with Specialization in Cyber Security & Forensics
Batch: 2016-20

Course Title: **MACHINE LEARNING & NEURAL NETWORKS**			Course Code: **DA8670**
Credit: **3**	L **3**	T **0**	P **0**
Year: **4th**			Semester: **VIII**

Unit I **Introduction:** Well-Posed learning problems, Basic concepts, Designing a learning system, Issues in machine learning. Types of machine learning: Learning associations, Supervised learning (Classification and Regression Trees, Support vector machines), Unsupervised learning (Clustering), Instance-based learning (K-nearest Neighbor, Locally weighted regression, Radial Basis Function), Reinforcement learning (Learning Task, Q-learning, Value function approximation, Temporal difference learning).

Unit II **Decision Tree Learning:** Decision tree representation, appropriate problems for decision tree learning, Univariate Trees (Classification and Regression), Multivariate Trees, Basic Decision Tree Learning algorithms, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

Unit III **Artificial Neural Network:** Perceptron learning, Pattern Classification. Hebb Rule. Adaline. Madaline. Delta Rule. Perceptron, Training a perceptron, Multilayer perceptron, Back propagation learning, Competitive learning, Hebbian learning, BAMs.

Unit IV **Supervised and Unsupervised learning**: Supervised and Unsupervised learning Reinforcement learning, Kohonen Self Organizing Maps, Adaptive Resonance Theory, Neural Network Applications. Recurrent Networks, Dynamically modifying network structure, .Support Vector Machines

Unit V **Inductive and Analytical Learning:** Learning rule sets, Comparison between inductive and analytical learning, Analytical learning with perfect domain theories: Prolog-EBG. Inductive-Analytical approaches to learning, Using prior knowledge to initialize hypothesis (KBANN Algorithm), to alter search objective (TangentProp and EBNN Algorithm), to augment search operators (FOCL Algorithm).

Text Book

1. Mitchell T.M., Machine Learning, McGraw Hill (1997) 2nd ed.
2. Alpaydin E., Introduction to Machine Learning, MIT Press (2010) 2nd ed.

Reference Book

1. 1. Bishop C., Pattern Recognition and Machine Learning, Springer-Verlag (2006) 2nd ed.

DIT UNIVERSITY
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Course Structure & Detailed Syllabus

of

B. Tech. in Electronics & Communication Engineering

Batch 2016-20

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Year: 1st **Semester: I**

Course Code	Course Title	L	T	P	Credit
JA1010	Engineering Mathematics-I	3	1	0	3.5
OA1210	Engineering Physics	3	1	2	4.5
LA1210	Essentials of Mechanical Engineering	3	1	2	4.5
HA1210	Professional Communication-I	3	1	0	3.5
DA1210	Computer Fundamental & C Programming	3	0	2	4
BA1010	Environmental Science	2	0	0	2
LA1220	Engineering Graphics	1	0	0	1
HA1310	Soft Skills Development	0	0	2	1
	Total				**24**

Year: 1st **Semester: II**

Course Code	Course Title	L	T	P	Credit
JA2010	Engineering Mathematics-II	3	1	0	3.5
BA1210	Engineering Chemistry	3	1	2	4.5
EA1210	Introduction to Electrical Engineering	3	1	2	4.5
FA1210	Introduction to Electronics & Communication	3	1	2	4.5
HA2210	Professional Communication-II	3	0	1	3.5
DA2210	Computer Programming in C++	3	0	2	4
LA1110	Workshop Practice	0	0	2	1
	Total				**25.5**

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Year: 2nd **Semester: III**

Course Code	Course Title	L	T	P	Credit
FA3210	Electronic Devices & Circuits	3	1	2	4.5
FA3221	Digital System Design	3	1	2	4.5
DA3210	Data Structures	3	0	2	4
FA3021	Electro-Magnetic Field Theory	3	1	0	3.5
FA3030	Signals & Systems	3	1	0	3.5
EA32F0	Network Analysis & Synthesis	3	1	2	4.5
FA3110	Computer Aided Design of Electronics Lab	0	0	2	1
	Total				**25.5**

Year: 2nd **Semester: IV**

Course Code	Course Title	L	T	P	Credit
FA4211	Digital Signal Processing	3	1	2	4.5
FA4220	Analog Integrated Circuits	3	1	2	4.5
FA4010	Principles of Antenna & Wave Propagations	3	1	0	3.5
FA4021	Computer Organization & Microprocessors	3	1	0	3.5
JA4010	Probability Theory, Random Variable & Stochastic Process	3	1	0	3.5
FA4030	VLSI Technology	3	1	0	3.5
FA4110	Minor Project of CAD Lab.	0	0	2	1
FA4310	Value Addition Training	0	0	2	1
FA4410	Industrial Tour	0	0	2	1
	Total				**26**

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Year: 3rd **Semester: V**

Course Code	Course Title	L	T	P	Credit
FA5210	Principles of Communication Engineering	3	1	2	4.5
FA5221	Microwave Engineering	3	1	2	4.5
FA5231	Advanced Microprocessor & Microcontroller	3	1	2	4.5
FA5020	VLSI Design	3	1	0	3.5
FA5010	Automatic Control Systems	3	1	0	3.5
HA5010	Principles of Management	2	0	0	2
FA5310	Aptitude Building-1	0	0	2	1
	Total				**24.5**

Year: 3rd **Semester: VI**

Course Code	Course Title	L	T	P	Credit
FA6210	Digital Communication	3	1	2	4.5
FA6220	Micro-strip Antenna	3	1	2	4.5
FA6010	Data Communication Networks	3	1	0	3.5
FA6020	Principles of Mobile Communication	3	1	0	3.5
	Inter- Departmental Elective -I	3	1	0	3.5
GC5010	Engineering Economics	2	0	0	2
FA6310	Aptitude Building-2	0	0	2	1
FA6110	Project Phase- I	0	0	2	1
	Total				**23.5**

List of Elective Subjects for VI Semester

Inter-Departmental Elective – I	
EA5210	Power Electronics & Devices
EA7010	Artificial Neural Networks & Fuzzy Logic
EA32L0	Electrical Machines

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Year: 4th **Semester: VII**

Course Code	Course Title	L	T	P	Credit
FA7210	Optical Fiber Communication	3	1	2	4.5
FA7010	Wireless Communication	3	1	0	3.5
FA7020	Design of Communication	3	1	0	3.5
	UG Elective-1	3	1	0	3.5
FA6310	Aptitude Building-2	0	0	2	1
FA7510	Industrial Training & Presentation**	0	0	2	4
FA7110	Project Phase- II	0	0	4	2
	Total				**22.5**

List of Elective Subjects for VII Semester

UG Department Elective – 1	
Course Code & Name	
FA7610	Digital System Design using Verilog
FA7620	Coding for Reliable Communication
FA7630	Industrial Electronics

** Evaluation of 6 weeks industrial training to be carried out during the semester.

Year: 4th **Semester: VIII**

Course Code	Course Title	L	T	P	Credit
	UG Departmental Elective-2	3	1	0	3.5
	UG Departmental Elective-3	3	1	0	3.5
	UG Departmental Elective-4	3	1	0	3.5
FA8010	Spread Spectrum Systems	3	1	0	3.5
	Open Elective	3	0	0	3
FA8110	Project Phase– III	0	0	8	4
	Total				**21**

Department of Electronics & Communication Engineering
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List of Elective Subjects for VIII Semester

UG Department Elective – 2	
FA8610	Low Power VLSI Design
FA8620	Selected Topics in Communication
FA8630	Optimal Control

UG Department Elective – 3	
FA86A0	PLC, SCADA & DCS
FA86B0	Radar and Navigation
FA86C0	Digital System Design using VHDL
FA86D0	Satellite Communication

UG Department Elective – 4	
FA86H0	CDMA, GSM Systems
FA86I0	Digital Image Processing
FA86J0	Optical Network
FA86K0	Analog VLSI Design
FA86L0	Embedded System
FA86M0	Signal Condition
FA86N0	Virtual Instrumentation
FA86O0	Bio-Medical Instrumentation

List of Open Electives (To be conducted in VIII Semester)

Sl. No.	Branch	Subject Code	Name of Elective subjects
1	Physics	OA8710 OA8720	1. Nano Scale Science and Technology 2. Photonics Technology
2	EE	EA8710 EA8720	1. Non-Conventional Energy Resources 2. Instrumentation and Process control
3	ME	LA8710 LA8720	1. Entrepreneurship development 2. Quality Management
4	Civil	CA8710 CA8720	1. Environment and Ecology 2. GIS
5	CSE	**DA8740** DA8710	1. Management Information System (MIS) 2. Business Intelligence
6	IT	IA8730 IA8721	1. Internet of Things 2. IT In Business
7	ECE	FA8710	1. Consumer Electronics
8	Humanities	HA8710 HA8720	1. Industrial Psychology 2. Human Values and Ethics
9	MBA	GA8710 GA8730 GA8740	1. Organizational Behavior 2. Digital Marketing 3. Financial Modeling with Spread sheet

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Batch: 2016-20

Course Title: **Engineering Mathematics-I**	Course Code: **JA1010**
Credit: **3.5**	L **3** T **1** P **0**
Year: **1st**	Semester: **I**

UNIT I: Differential Calculus-I [**9**]

Functions of single variable: Limit continuity and differentiability; Indeterminate forms; Mean value theorems; Role's Theorem; Taylor's theorem with remainders; Curve tracing.

UNIT II: Differential Calculus-II [**9**]

Successive differentiation; Leibnitz theorem; Partial differentiation; Euler's theorem; Expansion of functions of several variables; Extrema of functions of several variables; Lagrange's method of multipliers.

UNIT III: Integral Calculus [**9**]

Improper integral-Beta and Gamma functions; Double and Triple integrals; change of order of integration; change of variables; Dirichlet's integral and its applications; Application of multiple integral.

UNIT IV: Vector Calculus [**12**]

Vector Differentiation: Scalar and vector fields; gradient of scalar point function; directional derivatives; divergence and curl of vector point function; solenoidal and irrotational vectors.

Vector Integration: line, surface and volume integrals; Green's theorem; Stokes' theorem and Gauss divergence theorem (without proof).

Text Books:

- R. K. Jain & S. R. K. Iyenger, **Advanced Engineering Mathematics**, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.

Reference Books:

- E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, John &Wiley Sons, U.K., 2006.
- B. S. Grewal, **Higher Engineering Mathematics**, 42th Edition, Khanna publication, New Delhi, India, 2012.

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Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Engineering Physics**	Course Code: **OA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **I**

UNIT I:
Relativistic Mechanics: Inertial and Non-inertial Frames; Postulates of Special Theory of Relativity; Galilean and Lorentz Transformation; Length Contraction and Time Dilation; Addition of Velocities; Variation of Mass with Velocity and Mass Energy Equivalence.

UNIT II:
Interference: Introduction; Coherent Sources; Analytical treatment of interference; Young's double slit experiment and its analysis; Conditions of Interference; Fresnel's Biprism; fringes with white light; Determination of wavelength of monochromatic light by using Fresnel's Biprism method; Displacement of Fringes; Interference in plane parallel thin film (reflected and transmitted light) and wedge shaped film(reflected light only); Newton's Rings; Determination of wavelength of monochromatic light and determination of refractive index of a liquid by using Newton's ring method.

UNIT III:
Diffraction: Introduction; Difference between Interference and diffraction; resultant of superposition of n simple harmonic coherent vibrations; Fraunhofer diffraction due to single slit: resultant intensity; conditions of maxima; minima; angular and linear width of central maximum; Double slit diffraction: resultant intensity; missing order; N-slit diffraction : resultant intensity; conditions of maxima and minima; missing orders; angular width of principal maxima; Diffraction grating: formation of spectra and missing order spectra in spectrum; dispersive power of grating; Resolving power; Rayleigh Criterion of resolution; Resolving power of plane transmission diffraction grating.

UNIT IV:
Polarization: Polarised and unpolarised light and its pictorial representation; plane of polarisation and plane of vibration; Phenomenon of Double Refraction; positive and negative double refracting crystals; properties of ordinary and extra-ordinary Rays; Nicol Prism and its application as a polariser and analyser; Mathematical analysis of superposition of two linearly polarised light vectors; retardation plates – half wave plate and quarter wave plate; Production and detection of Plane; Circularly and Elliptically Polarized Light.
Laser: Spontaneous emission; stimulated emission and stimulated absorption; Einstein's A and B Coefficients and relation between them; Principle of Laser Action; Construction and Working of He-Ne; Semiconductor Laser.

UNIT V:
Wave Mechanics : Wave Particle Duality; de Broglie Concept of Matter Waves; Davisson and Germer experiment; Concept of wave packet; group and phase velocity; Heisenberg Uncertainty Principle and its applications viz. non existence of electron in nucleus; radius and energy of Bohr's first orbit; Schrödinger time independent and time dependent wave equation; Physical interpretation of wave function; Application of Schrodinger wave equation: Particle in a one dimensional box (eigen function and eigen values).
Introduction to Fibre Optics: Fundamental ideas about optical fiber; Types of fibers; Acceptance angle and cone; Numerical Aperture.

Text Books:

1. AjoyGhatak**; Optics;** Tata Mc-Graw Hill Education;2009.
2. Subramanyam; BrijLal;**A Text Book of Optics**; S. Chand, 2004.
3. K. Thyagarajan, AjoyGhatak; **Lasers: Fundamentals and Applications**; Second;Springer, 2010.
4. AjoyGhatak& K. Thyagarajan ;**Introduction to Fiber optics;**Cambridge University Press,1998.
5. Halliday, Resnick& Walker; **Principles of Physics**; Nineth, Wiley, India;2013

Reference Books:

1. Arthur Beiser ;**Concepts of Modern Physics**; Tata Mc-Graw Hill Education;2003.
2. Robert Resnick;**Introduction to Special theory of Relativity** ; First; John Wiley& Sons; 1968.
3. Jenkins and White ;**Fundamentals of Optics**; Fourth; McGraw-Hill;2001
4. David. J. Griffith; **An Introduction to Quantum Mechanics**;Second; Pearson prentice Hall; 2004.
5. Young and Freedman;**Sears and Zemansky's University Physics**,Tenth; Addison-Wesley, 2000.

List of Experiments

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help ofFresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locatethe position of cardinal points.
4. To determine the specific rotation of cane sugar solution using bi quartz polarimeter.
5. To determine the wavelength of spectral lines using plane transmissiongrating.
6. To determine the specific resistance of the material of given wire usingCarey Foster's bridge.
7. To determine the variation of magnetic field along the axis of a currentcarrying coil and then to estimate the radius of the coil.
8. To verify Stefan's Law by electrical method.
9. To calibrate the given ammeter using potentiometer.
10. To calibrate the give voltmeter using potentiometer.
11. To determine energy band gap of a given semiconductor material by p-n junction method.
12. To determine the viscosity of water by Poisseuille's method.

Note: Additional experiments may be added based on contents of syllabus.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Essentials of Mechanical Engineering**	Course Code: **LA1210**
Credit: 4**.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **I**

UNIT – I **9L**

Introduction to Engineering: Difference between Science and Technology, history of wheel, introduction to prime movers, transmission system, belt, pulleys, gear system and nomenclature, braking system, Mechanism, lever mechanism, Working principle of power generation system, hydel power plant, thermal power plant and its main components.

Coplanar Force system: Resolution of force in two mutually perpendicular direction Free Body Diagram, Moment, Varignon's theorem, static equilibrium, Lami'sTheorem, type of joints/Support, Type of load: point load, uniformly constant and varying loads, beam and its type.

UNIT – 2 **7L**

Engineering material and their properties: Details of hook's law, Proportional limit, Yield point, Yield Stress, Engineering strain, Engineering stress, True stress and Strain, Plasticity, Elasticity, Allowable Strength, Hardness, Ductility, toughness, Fatigue, creep, strain energy, Impact Strength, Young modulus of Elasticity, Bulk Modulus, Poission Ration and its relation in between.

Stress and strain: Normal stress and strain, principle of Superposition, Deformation in stepped and composite bar.

UNIT – 3 **7L**

Thermodynamics: Macroscopic & microscopic study point of view, System, Surrounding and Universe, Phase, Property, State, Path, Process, Cyclic and non-cyclic processes, Quasi static process, Reversible and irreversible processes , Thermodynamic equilibrium, Concept of continuum, Energy and its forms, Enthalpy, Zeroth law, Different temperature scales and theory of temperature and Pressure measurement.

UNIT – 4 **8L**

Laws of Thermodynamics: Thermodynamic definition of work, Thermodynamic processes, Calculation of work in various processes and sign convention, Non-flow work and flow work, Joules' experiment, First law of thermodynamics, Internal energy and enthalpy, First law of thermodynamics applied to open systems, Steady flow energy equation and its applications, First law analysis for closed system (non flow processes), Limitations of first law of thermodynamics, PMM-I.

Statement of Second Law of Thermodynamics: Kelvin Planck's statement and Clausius statement and their equivalence.

UNIT – 5 **9L**

Power generation: Air standard cycle**,** IC Engine**,** Carnot cycle, Otto cycle, Diesel cycle, Important components of I.C.Engine, two stroke and four stoke engine, S.I. and C.I. engines, efficiency of Otto and diesel cycle

Basics of Heat Transfer: Concepts of the mechanisms of heat flows: conduction, convection and Radiation heat transfer application in engineering.

Reference Books:

1. Basu,A.R; A Text book of Engineering Mechanics(Applied Mechanics);2003 Edition; Dhanpat Rai & co.(p) Ltd, Delhi.
2. Chandramouli, P.N; Engineering Mechanics; Second Printing; PHI Learning Private Limited, Delhi; 2013.
3. Rajput, R. K; Material Science; S. K. Kataria & Sons, New Delhi.
4. Dubey, N. H; Engineering Mechanics, Statics and Dynamics; First reprint; McGraw Hill Education (India) Private Limited, New Delhi, 2013.
5. Ratan, S.S; Theory of machines; Second Edition; Tata McGraw Hill Publishing Company Limited, New Delhi.
6. Nag.P.K.; Engineering Thermodynamics; 3rd Edition; Tata McGraw Hill Publishing Company Limited, New Delhi.
7. Nag.P.K.; Heat and Mass Transfer; Tata McGraw Hill Publishing Company Limited, New Delhi.
8. Kumar.D.S; Basic of Mechanical Engineering; S. K. Kataria & Sons, New Delhi.

Essentials of Mechanical Engineering Lab

List of Experiments

1. Tensile test
2. Impact test
3. Hardness test
4. Pulley experiment
5. Experiment on conduction heat transfer
6. Demonstration of Impulse and reaction turbine
7. Study of 4s and 2S engine petrol Engine
8. Study of 4s and 2S engine Diesel Engine
9. Study of refrigerator and air conditioning

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Professional Communication – I**			Course Code: **HA1210**
Credit: **3.5**	L **3**	T **1**	P **0**
Year: **1st**			Semester: **I**

UNIT 1: **COMMUNICATION** **(6 Hrs)**

1. Communication: Definition and Process of Communication.
2. Types of Communication: Formal and Informal Communication, Verbal and Non-Verbal Communication.
3. Barriers to Communication: Intrapersonal and Interpersonal Barriers. Semantic Barriers, Physical Barriers, Psychological Barriers, and Organizational Barriers.

UNIT 2: **LISTENING SKILLS & SPEAKING SKILLS** **(8 Hrs)**

1. Importance and Objective of Listening Skills, Process of Listening, Listening and Hearing, Types of Listening, and Methods for Improving Listening Skills
2. Listening Comprehension: Identifying General and Specific Information.
3. Listening for Note taking and drawing Inferences.
4. Importance of Speaking Skills, Types of Speaking, Methods for Improving Speaking Skills
5. Introduction to Phonetic Transcription: Familiarization with British and American Usage.

UNIT 3: **READING SKILLS** **(4 Hrs)**

1. Importance of Reading Skills, Types of Reading Skills, Methods of Improving Reading Skills.
2. Vocabulary Building: Antonyms, Synonyms, Homophones, Homonyms, and One-Word Substitution, Etymology and roots.

UNIT 4: **WRITING SKILLS** **(10 Hrs)**

1. Importance of Writing Skills, Types of Writing Skills, and Methods for Improving Writing Skills.
2. Sentence and Paragraph Construction. Writing Expository, Argumentative and Deductive Order etc Paragraphs.
3. Précis Writing
4. Basic Letter Writing: Format and Style of Formal Letters.

UNIT 5: **ONE ACT PLAY** **(6 Hrs)**

Practice of LRSW through the study of the one act play, ***THE REFUND*** by **Fritz Karinthy**.

TEXT BOOK

1. Gupta, Ruby. Basic Technical Communication, Cambridge University Press, New Delhi.2012.

REFERENCE BOOKS

1. Rizvi, Ashraf. Effective Technical Communication, McGraw Hill, New Delhi. 2005
2. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011
3. Tyagi, Kavita& Padma Misra. Basic Technical Communication, PHI, New Delhi. 2011
4. Lewis, Norman. Word Power Made Easy, W.R Goyal Pub. & Distributors.1995
5. Ford A, Ruther. Basic Communication Skills; Pearson Education, New Delhi.2013
6. Aslam, Mohammad. Introduction of English Phonetics and Phonology Cambridge.2003
7. Kameswari, Y. Successful Career Soft Skills and Business English, BS Publications, Hyderabad.2010
8. English Pronouncing Dictionary, Cambridge.2012
9. The Oxford Guide to Writing and Speaking. OUP, Delhi.2011

Professional Communication – I Lab

Lab 1	Neutralization of Mother Tongue Influence through manner of articulation
Lab 2	Common Errors in English and Indianisms.
Lab 3	Introduction to Speech Sounds – Practicing Vowel and Consonant sounds
Lab 4	Syllable, word stress, Sentence stress
Lab 5	Pause group, Intonation & Rhythm
Lab 6	Functional English
Lab 7 & 8	Everyday Conversation : Greetings, Apologies, Requests, At a Restaurant, Shopping, Groceries, Hiring an Apartment, Travel Courses, etc.
Lab 9	Developing Listening skills through cultural movies
Lab 10 &11	Movie - To provide exposure to the target language
Lab 12	Final evaluation based on Extempore

References: (Software and Videos)

1. Wordsworth English Language laboratory software
2. Wordsworth Prep 1-2-3
3. Connected Speech Level 1-2-3
4. Learn To speak English CD 1-2-3-

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Computer Fundamentals and 'C' Programming**	Course Code: **DA1210**
Credit: **4**	L **3** T **0** P **2**
Year: **1st**	Semester: **I**

UNIT 1 **(8 L)**

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system: Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

UNIT 2 **(8 L)**

Standard I/O in C, Fundamental data types- Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external**,** Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Fundamentals of C programming: Structure of C program**,** writing and executing the first C program, components of C language. Standard I/O

UNIT 3 **(8 L)**

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch**,** program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break, continue and goto statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

UNIT 4 **(8 L)**

Arrays: Array notation and representation, manipulating array elements using one and two dimensional arrays, linear searching, sorting (bubble sort), strings, matrix manipulation (transpose, addition, multiplication).

Structures: Purpose and uses of structures, declaring structures, array of structures, union, enumerated data types

UNIT 5 **(8 L)**

Pointers: Pointers: pointer variables, pointer operator, pointer expression, array of pointers, multiple indirection, pointers to functions, dynamic memory allocation functions.

File handling**,** standard C preprocessors**,** defining and calling macros, conditional compilation.

Text Books:

1. YashwantKanetkar, "Let us C", BPB Publications, 2nd Edition, 2001.
2. Herbert Schildt, "C:The complete reference", OsbourneMcgraw Hill, 4th Edition, 2002.
3. Computer Fundamentals and Programming in C. ReemaThareja, Oxford Publication
4. P.K. Sinha "Computer Fundamentals" B.P.B Publication.

Reference Books:

1. Raja Raman, "Computer Programming in C", Prentice Hall of India, 1995.
2. Kernighan & Ritchie, "C Programming Language", The (Ansi C Version), PHI, 2nd Edition.
3. Byron Gottfreid "Schaum's Outline of Programming with C".

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20
List of Programs in 'C' Lab

Lab 1	(a) WAP to perform simple arithmetic operations using different data types. (b) WAP to show swap of two no's without using third variable.
Lab 2	(a) WAP to find the roots of a quadratic equation. (b) WAP to check the number is odd or even and find the sum of all odd and all even separately.
Lab 3	(a) WAP to find out whether the given number is prime or not. Find sum of all prime upto N. (b) WAP to reverse a given number and check the palindrome status.
Lab 4	WAP to print corresponding days of a week using switch case.
Lab 5	WAP to find and generate the Armstrong number.
Lab 6	WAP to print pattern triangle like Floyd's, Pascal, pyramid triangle.
Lab 7	(a) WAP to interchange two values using call by value and call by reference. (b) WAP to print factorial of a number using recursion & without using recursion.
Lab 8	WAP to print Fibonacci series. (**a**) Without using function (**b)** using function (**c)** using recursion
Lab 9	(a) WAP to print an array and find greatest/smallest element of an array. (b) WAP to perform linear searching in an array.
Lab 10	(a) WAP to insert/ delete element from an array. (b) WAP to sort the array's element using Bubble sort.
Lab 11	WAP to perform the following string functions. **a.** Strlen **b**. strcmp **c.**strcpy **d**. strcat **e**. strlwr **f**.strupr
Lab 12	Declare a suitable structure of a college and print the name and DOB of the student have scored more than sixty percent marks in end semester exam.
Lab 13	Declare a suitable structure for an organization and print all the names of employees having salary more than Rs.1000.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Environmental Science**	Course Code: **BA1010**
Credit: **2**	L **2** T **0** P **0**
Year: **1st**	Semester: **I**

Unit – 1 **(6L)**

Natural Resources: Renewable and non-renewable resources

Definition, scope, importance and need for public awareness, natural resources and associated problems.

- Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
- Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
- Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture and green revolution, water logging, salinity.
- Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources.
- Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Unit – 2 **(5L)**

Ecosystems

Concept, Structure and function of an ecosystem, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the Forest and aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit – 3 **(5L)**

Biodiversity and its conservation

Introduction – Definition: genetic, species and ecosystem diversity. Bio geographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-sports of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit – 4 **(6L)**

Environmental Pollution

Definition, Cause, effects and control measures of:-

a. Air pollution b. Water pollution c. Soil pollution
d. Marine pollution e. Noise pollution f. Thermal pollution
g. Nuclear hazards

• Solid waste Management and biomedical waste: Causes, effects and control
• Role of an individual in prevention of pollution.
• Pollution effects-global warming, acid rain, ozone depletion, smog and case studies.
• Disaster management: floods, earthquake, cyclone and landslides.

Unit – 5 **(6L)**

Social Issues and the Environment

- From Unsustainable to Sustainable development
- Water conservation, rain water harvesting, watershed management
- Environmental Impact Assessment and Resettlement and rehabilitation problems.
- Climate change
- Wetland conservation.
- Role of remote sensing and GIS in environmental monitoring and analysis
- Environment Protection Act. 1986
- Air (Prevention and Control of Pollution) Act. 1981
- Water (Prevention and control of Pollution) Act 1974
- Wildlife Protection Act 1972
- Forest Conservation Act 1980.

Field work:

- Visit to a local area to document environmental assets river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

REFERENCE BOOKS:

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad –380 013, India, Email:mapin@icenet.net (R)
2. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
3. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
4. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
5. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
6. Gleick, H.P. 1993. Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
7. Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
8. Mckinney, M.L. & School, R.M. 1996. Environmental Science Systems & Solutions, Web enhanced edition. 639p.
9. AnubhaKaushik&Kaushik, C.P. 2009.Perspectives in Environmental Studies, New Age International Publishers.
10. Manahan. S.E., Environmental chemistry, 9th edition.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Engineering Graphics**	Course Code: **LA1220**
Credit: 1	L **1** T **0** P **0**
Year: **1st**	Semester: **I**

UNIT – 1
Introduction: Sheet Layout, Types of Sheet, Size of Sheets, Title blocks, Type of lines, Lettering, Dimensioning, Scale (Full, Reduced, Large) Geometrical Constructions,
UNIT – 2
Projection: Methods of Projection, Planes of Projection, Projection of points, Projection of straight lines, Projection of auxiliary planes, Projection of planes.
UNIT – 3
Projection of solids, Sections of solids.
UNIT – 4
Development of surfaces
UNIT – 5
Isometric Projections

Reference Books:
1) Bhatt N. D. & Panchal V. M, "Engineering Drawing", Charotar Publisher, 2007.
2) Dhanjay A Jolhe, "Engineering Drawing" Tata McGraw Hill, 2008.
3) Gill P.S "Engineering Graphics" S. K. Kataria & Sons, 2009
4) John K.C, "Engineering Graphics" , 2nd edition, PHI Learning Pvt. Ltd., 2010

List of Experiments

1. Introduction to AutoCAD Commands, Explaining need of AUTO CAD over Manual drafting, Simple Drawings.
2. Sheet on Lettering and Geometric construction.
3. Orthographic Projections, Basic problem based on Projection of points.
4. Sheet on Projection of Lines.
5. Sheet on Projection of Planes.
6. Sheet on Projection of Auxiliary Planes.
7. Sheet on Projection of Solids.
8. Development of Surfaces.
9. Sheet on Isometric Projections from orthogonal views.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Engineering Mathematics – II**	Course Code: **JA2010**
Credit: **3.5**	L **3** T **1** P **0**
Year: **1st**	Semester: **II**

UNIT I: **(10L)**

Linear Algebra

Matrices; Inverse of matrix; Echelon form; Rank of matrix; Consistency and solution of a system of linear equations; Linear dependence and independence of vectors; Matrix transformations; Eigen values and eigenvectors; Cayley– Hamilton theorem; Reduction to diagonal form; Vector spaces; Sub spaces; Basis; Dimension; Linear Transformation**.**

UNIT II: **(8L)**

Differential Equations

Linear differential equations first order and first degree; Linear differential Equations of higher orders with constant coefficients; Complementary functions and Particular integrals; Euler-Cauchy linear differential equations; Simultaneous linear differential equations; Method of variation of parameters.

UNIT III: **(6L)**

Infinite Series

Introduction; Sequences; Series; Convergence; Series of positive terms; Comparison test; Integral test; D'Alembert's Ratio test; Cauchy's root test; Alternating series; Leibnitz rule.

UNIT IV: **(8L)**

Fourier Series

Periodic functions; Fourier series of Periodic functions; Euler's formulae; Functions having arbitrary period; Change of intervals; Even and Odd functions; Half range sine and cosine series.

UNIT V: **(8L)**

Laplace Transform

Laplace Transform; Existence theorem; Properties of Laplace Transform ; Laplace Transform of derivatives and integrals; Laplace Transform of Periodic functions; Unit Step function and Error Function; Dirac- Delta function; Unit impulse function; Convolution theorem; Applications of Laplace Transform to solve linear and simultaneous differential equations.

Text Books:

1. R. K. Jain & S. R. K. Iyenger, **Advanced Engineering Mathematics**, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.
2. E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, John Wiley & Sons, U.K., 2006.

Reference Books:

1. W. E. Boyce and R. Di Prima, **Elementary Differential Equations**, (8th Edition), John Wiley & Sons, U.K., (2005).
2. B. S. Grewal, **Higher Engineering Mathematics**, 42nd Edition, Khanna Publication, New Delhi, India, 2012.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Engineering Chemistry**	Course Code: **BA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **II**

UNIT – I

Water Chemistry

Introduction, Analysis of Water – Alkalinity, Chlorides and Dissolved Oxygen, Hardness of Water - Temporary and Permanent hardness, Estimation of hardness by EDTA Method, Disadvantages of Hard Water, Numerical problems.

Water for Industrial purpose – Boiler Feed Water, Boiler Troubles (Priming and Foaming, Boiler Corrosion, Scales and Sludges, Caustic Embrittlement), Water Treatment: Internal Treatment (Colloidal, Phosphate, Calgon, Carbonate Conditioning), External Treatment (Lime-Soda Process, Zeolite Process, Ion- Exchange Process), Numerical Problems.

UNIT – II

Physical Chemistry

Electrochemistry: Reference electrodes, Ion selective electrodes, Chemically modified electrodes as sensors, Electrochemical energy systems, Lithium batteries, Fuel cells.

Thermochemistry: Hess's Law, Heat of a reaction, Effect of temperature on heat of reaction at constant pressure (Kirchoff's eq.), Heat of dilution, Heat of hydration, Heat of neutralization and Heat of combustion.

Surface chemistry: Surface and interfacial tension, Capillary pressure.Adsorption phenonmenon, Adsorption of gaseson solids, Frendlich and Langmuir adsorption isotherms,Role of adsorbents in catalysis, ion-exchange and pollution abatement.

UNIT – III

Science of Corrosion and Protective Coatings

Introduction, Types of Corrosion, Theories of Corrosion and Mechanism, Factors Influencing Corrosion.Control of Corrosion.

Types of Protective Coatings: Metallic Coatings, Anodic Coatings, Galvanization, Cathodic Coatings, Tinning, Metal Cladding, Electroplating (Chromium Plating, Metal Spraying, Cementation-Sheradizing, Colourizing, Chromizing).

UNIT – IV

Introduction to Polymers and Nano-materials

Polymerization, Classification of polymers, Addition and Condensation Polymerizations. Plastics - Thermosetting and Thermoplastics. Preparation, Properties and Uses of Polyethylene, PVC, Teflon, Bakelite, Nylon, Polyester, Polyurethane, Ziegler-Natta catalyst, conducting polymers.Rubber- Processing of Natural Rubber, Vulcanization and Compounding. Elastomers: Buna-S, Buna- N, Thiokol.

Introduction to Nano-materials: Fullerenes, Nano-tubes, Nano-wires, Nano-cones, Nano-dots, Nano-sphere, Haeckelites. Their electronic and mechanical properties, Production methods for CNTs. Applications of nano materials in i) Medicine ii) Catalysis iii) Environmental Technologies iv) Electronics& related fields. v) Mechanics.

UNIT – V

Fuels & Lubricants

Fuels: Classification, crude oil: composition and fractionation, Octane & Cetane Number and their significance; calorific value of fuel, Determination of calorific value of fuels, bomb calorimeter, Solid fuels - Proximate and ultimate analysis, Numericals problems.

Lubricants: Functions of lubricants, Mechanism of Lubrication (thick film or hydrodynamic lubrication, thin film or boundary lubrication, extreme pressure lubrication), Classification and properties of lubricants- Viscosity, Flash and fire point, Cloud and pour point, Aniline point, Neutralization number and mechanical strength. Numerical problems on acid value and saponification value.

Text Books:

1. Chemistry in Engineering & Technology (Vol I & II) (Latest ed.) By J.C. Kuriacose& J. Rajaraman, Tata McGraw-Hill Co, New Delhi.
2. Engineering Chemistry by O.G. Palanna, Tata McGraw-Hill Co, New Delhi.

Reference Books:

1. Atkins' Physical Chemistry by Peter W. Atkins and Julio de Paula, Oxford University Press.
2. Principles of Physical Chemistry (Latest ed.) By Puri, Sharma & Pathania.
3. Organic chemistry, Morrison and Boyd, Pearson Prentice Hall, 2011
4. Environmental chemistry, S.E. Manahan, 9th edition, CRC Press.
5. Textbook of polymer science by F.W. Billmeyer, Wiley India.

Engineering Chemistry Lab

List of Experiments

1. Estimation of hardness of water by EDTA method
2. Estimation of total alkalinity in the given water sample.
3. Estimation of dissolved oxygen in the given water sample.
4. Estimation of available chlorine in the given sample of bleaching powder.
5. pH-metric titration.
6. Determination of viscosity of lubricants by Redwood viscometer / Ostwald's viscometer.
7. Determination Surface Tension of lubricants.
8. Determination of Flash point of a given oil by Pensky_Marten's flash point approach.
9. To Determine Saponification-value of the given Lubricating Oil.
10. To Determine Acid-Value of the given Lubricating Oil.
11. To determine the moisture, volatile and ash contents in a given coal sample by proximate analysis.
12. To study the adsorption of acetic acid on activated charcoal.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Introduction to Electrical Engineering**	Course Code: **EA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **II**

UNIT – 1
D.C. NETWORK THEORY
Review of basic circuit theory concepts, Mesh and Nodal analysis, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Star–delta transformation, Magnetic Circuits.

UNIT – 2
A.C. CIRCUITS & MEASURING INSTRUMENTS
*Single Phase A.C.:*Phasor representation of voltage and current, A.C. circuit behavior of resistance, inductance, capacitance & their combination in series and parallel, Power triangle, Power factor, Concept of series & parallel resonance.
*Three Phase A.C.:*Star – delta connections, Relation between line and phase quantities, three phase power and its measurement, What is 3 phase 4 wire and 3 phase 5 wire system?
Measuring Instruments: Construction and principle of voltage and current measuring instruments.

UNIT – 3
TRANSFORMERS
Principle of operation, Types of construction, Phasor diagram, Equivalent circuit, Efficiency and voltage regulation of single phase transformer, O.C. and S.C. tests.

UNIT – 4
D.C. & SYNCHRONOUS MACHINES
D.C. Machines: Construction and working principle of d.c. generator and d.c. motor, Types of d.c. machines, E.M.F. equation, Torque equation, Magnetization and load characteristics, Losses and efficiency, Need of starter in d.c. motors.
Synchronous Machines: Construction and Principle of operation of Alternator and Synchronous Motor.

UNIT – 5
INDUCTION MOTORS
Three Phase Induction Motors: Principle of operation of 3-Ø induction motor, Types of 3-Ø induction motor, Need of starters in 3-Ø induction motors, Slip – torque characteristics,
Single Phase Induction Motor: Principle of operation of single phase induction motor, Methods of starting of single phase induction motor.

Reference Books:
1. V. Del Toro. " Principles of electrical Engineering, "Prentice hall International.
2. W.H. Hayt& J.E. Kemmerly," Engineering circuit Analysis, "McGraw Hill.
3. I. J. Nagrath, "Basic Electrical Engineering," Tata Mc. Graw Hill.
4. A. E. Fitgerald, D.E., Higginbotham and A Grabel, "Basic Electrical Engineering" McGraw Hill
5. H. Cotton, "Advanced Electrical Technology" Wheeler Publishing.

Basic Electrical Engineering Lab

(Any Ten)

1. Verification of Network Theorems.
2. Study of diode characteristics. Study of phenomenon of resonance in RLC series circuit.
3. Measurement of power in a three phase circuit by two wattmeter method.
4. Measurement of efficiency of a single phase transformer by load test.
5. Determination of parameters and losses in a single phase transformer by OC and SC test.
6. Study of characteristic of DC Motor.
7. Study of characteristic of AC Motor.
8. DC generator characteristics.
9. 10. Speed control of dc shunt motor.
10. Study running and reversing of a three phase induction motor.
11. Study of a single phase energy meter.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Introduction to Electronics & Communication**	Course Code: **FA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **II**

UNIT 1: Fundamental of Semiconductors ***10 L***

Energy bands in semiconductors, intrinsic and extrinsic semiconductors, Fermi Level in Intrinsic and Extrinsic semiconductor, Carrier transport in semiconductors: diffusion current, drift current, mobility, Hall Effect and resistivity. Generation and recombination of carriers.

UNIT 2: Application of Low Power and High Power Diodes ***10 L***

Diode circuits: Construction, Junction diode characteristics, Half and full wave rectifiers - Expression for efficiency and ripple factor - Bridge rectifier – π Filter circuits, Clipper, Clamper and multipliers using diodes, Zener Diode Characteristics - Regulated power supply using Zener diode.

UNIT 3: Transistor fundamentals ***8 L***

Transistor circuits: Characteristics of a transistor in CB, CE and CC modes - Relatively merits - Biasing of Transistors - Load Line and operating point concept (both AC and DC). Construction and working of JFET and MOSFET.

UNIT 4: Digital fundamentals and Introduction to Signals ***8 L***

Basic logic gates: AND, OR, and NOT – implementation of all gates using Universal gates, Number Systems conversions, Boolean algebra, K-map (upto 4 variables). Source of Information, Types of Signals.

UNIT 5: Basics of Communications & Instrumentation ***9 L***

Communication Systems, Communication Channels, Need of modulation, Types of modulations (Wave shapes and final expression only), Study of Piezoelectric, PMMC, LVDT and Strain Gauge transducers and their classifications and display device (7 segment) only.

Reference Books:

Unit 1. Electronics Devices and Circuits, Millman and Halkias, Tata McGraw Hill, 4th ed.
Unit 2 & 3. Electronic Devices and Circuit Theory, Robert L. Boylestad, Prentice Hall Higher Edu., 2000.
Unit 4. Digital Design, Morris Mano, PHI
Unit 4. Modern Digital & Analog Communications, B. P. Lathi, OUP
Unit 5. Electronic Communication Systems, John Kennedy , Tata McGraw Hill, 4th ed.
Unit 5. Electronic Instrumentation - H. S. Kalsi

ELECTRONICS ENGINEERING LAB.

1. To identify and Study of the various component and Devices of electronics with their specification (CRO, Function Generator, Multimeter, Power Supply, resistor, capacitor, inductor, ICs, LED, potentiometer etc.)
2. To study the V-I characteristics of PN diode and Zener diode.
3. To find the efficiency of Rectifiers and ripple factor of capacitive and non-capacitive half wave and full wave rectifier.
4. To Study and Verify clipper and clamper with biased circuits.
5. To find the characteristics of CB and CE amplifiers.
6. Determine the characteristics of FET.
7. To find out the power energy of various periodic and non periodic signals.
8. To verify the logic gates using diodes.
9. Study and observations of AM & FM Waveforms.
10. Study of various transducers (Strain Gauge).

***** *Plus 2-3 value added experiments can be performed.*

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Professional Communication – II**	Course Code: **HA2210**
Credit: **3.5**	L: **3** T: **0** P: **1**
Year: **1st**	Semester: **II**

UNIT 1: **PROFESSIONAL COMMUNICATION** **(6 Hrs)**

1. Importance and Features of Business Communication, Flow and Channels of Communication in an Organization.
2. Introduction to Technical Communication, Types and History of Technical Communication.
3. Difference between General and Technical Communication, and Importance of Technical Communication.
4. Characteristic of Technical Communication, and Elements of Style.
5. Process of Preparing a Technical Document.
6. Elements and Features of Scientific Articles.
7. Compunication, E- mail, E- tools and Encyclopedia.

UNIT 2: **BUSINESS CORRESPONDENCE** **(8 Hrs)**

1. Business Correspondence – Principles, Features, Types, Format and Layout of Business Letter.
2. Inter Office Correspondence – Letters of Enquiry, Quotation, Order, Sales, and Complaint.
3. Intra Office Correspondence: Notice, Agenda, Minutes, and Memorandum.
4. Job Application Letter.

UNIT 3: **TECHNICAL PROPOSAL and TECHNICAL REPORT** **(8 Hrs)**

1. Technical Proposal - Introduction, Purpose, Features, Types, Format, Importance, and Writing Technical Proposals and Plagiarism.
2. Technical Report - Features, Types, Style, Format, Relevance, and Writing Technical Reports.

UNIT 4: CORPORATE COMMUNICATION SKILLS **(8 Hrs)**

1. Dimensions and importance of EQ
2. Interpersonal communication skills - Life Position, and Transactional Analysis
3. Johari Window: Role of Feedback and Disclosure in Communication; Accepting Criticism
4. Cross Cultural Communication
5. Attitude
6. Perception
7. Personality Attributes and Communication: Self Esteem, Self-Monitoring, Impression Management, and Locus of Control.
8. Conflict and Negotiation

UNIT 5: PROJECT **(6 Hrs)**

REPORT WRITING/ PROPOSAL WRITING

The students will write a Report **OR** a Proposal consisting of 10-15 pages.

REPORT WRITING

1. **For B.Tech. students**-
    a. Technical Report describing new machinery, a report on the sudden break down in production unit, and market survey report for formulating new market strategy.
2. **For B.Pharma. students**
    a. Technical Report based on the site inspection of a drug manufacturing unit, Survey Report on Health Awareness and Self-Medication.

3. **For B.Arch. students**
    a. Technical Reports based on a Site Inspection for Geographical and Geological aspects of a particular location, A Report on the Architectural Survey of a Monument. Architectural

PROPOSAL WRITING

1. **For B.Tech. students**
    a. Technical Proposal to organize a Technical Training Program, To develop new range of a product and to start a new venture.
2. **For B.Pharma. students**
    a. Technical proposal to establish a new laboratory, To create new drug-composition and to visit to a Super Specialty Hospital.
3. **For B.Arch. students**
    a. Technical Proposal for an Archeological Site visit , To Construct New Buildings.

Report Writing and Proposal Writing carries 30 marks equivalent to three class tests.

TEXT BOOK

1. Gupta, Ruby. Advanced Technical Communication, Cambridge University Press, New Delhi. 2011.

SUGGESTED REFERENCE BOOKS

1. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011.
2. Tyagi, Kavita& Padma Misra. Advance Technical Communication, PHI, New Delhi.2011
3. Technical Communication, Cengage Learning, New Delhi.2010
4. Technical Communication, OUP, New Delhi. 2013
5. Wallace, Masters Personality Development, Cengage Learning, New Delhi.2006
6. Barrass, Robert: Students Must Write, Foundation books, Cambridge, New Delhi.2006
7. Rao, Bhaskar: Successful Career Soft Skills and Business English, BS Publications, Hyderabad.2012
8. Chakrawarthi: Soft Skills for Professionals, Wiley India.2011

Professional Communication – II Lab

Lab 1	Vocabulary Building
Lab 2	Telephone Etiquette: Making an appointment , answering Calls
Lab 3	Public Speaking
Lab 4	Group Discussion: Do's and Don'ts of GD
Lab 5 & 6	Interview Skills: Preparation
Lab 7	PP Presentation Skills: Techniques of making effective presentation
Lab 8	Meeting : Conducting meetings effectively
Lab 9	Developing Negotiating skills
Lab 10 &11	Reading Comprehension
Lab 12	Evaluation

References: (Software and Videos)

1. Wordsworth English Language laboratory software
2. Wordsworth Prep 1-2-3
3. Communicate
4. Train 2 Success
5. Additional PPTs

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Computer Programming in C++**			Course Code: **DA2210**
Credit: **4**	L **3**	T **0**	P **2**
Year: **1st**			Semester: **II**

Unit -1 **8L**

Introduction to Object Oriented Programming, including methodologies, programming techniques, Object Oriented languages.
Overview of C++ basic structures, including the main () function, C++ data types, different type of operators expressions and statements, standard Input/output, Simple flow of control, Defining user defined Functions.

Unit -2 **8L**

General overview of objects and classes, Object and classes in C++, including class definition, Defining members inside or outside, accessing of members, constructors, types of constructors, destructors and Pointer to class object.

Unit-3 **8L**

Polymorphism: function overloading, methods of overloading, constructor overloading, Operator overloading.
General overview of inheritance: Introduction, Categories of inheritance, public/protected/private inheritance, constructors and destructors in derived classes, and Virtual Base class.

Unit-4 **8L**

Function overriding and virtual functions, Abstract class and abstract base class, Friend functions, Templates in C++, function templates, class templates, templates and inheritances, templates and static members.

Unit-5 **8L**

File handing in C++: opening of file, closing of file, text files, binary files, Reading and writing into a file. Exception Handling in C++, including usage, try, throw and catch.

Text Books:

1. Kip R. Irvine, C++ and Object-Oriented Programming, Prentice Hall, 1997
2. R. Lafore, "Object Oriented Programming using C++", BPB Publications, 2004
3. E Balagurusamy "Object Oriented Programming with C++" T.M.H 2nd edition

Reference Books:

1. Schildt Herbert, "C++ Programming", 2nd Edition, Wiley DreamTech.
2. YashwantKanethkar, "Object Oriented Programming using C++",BPB, 2004

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20
List of Programs in 'C++' Lab

Lab 1	(a) WAP to print first 10 prime numbers. (b) WAP to demonstrate nested loops. (c) WAP to print reverse of a given number. (d) WAP to read two numbers from keyboard and display the larger one.
Lab 2	(a) Create a class called Employee that includes three pieces of information as instance Variables – a first name (type String), a last name (type String) and a monthly salary (Double) (b) Create a constructor in above class to initialize the three instance variables. Provide a get method for each instance variable. (c) WAP to demonstrate destructors.
Lab 3	(a) Program to implement different types of inheritances like Multiple, Multilevel and hybrid. (b) Write a program in C++ demonstrating the public, protected and private parameters. (c) Write a program in C++ to demonstrate destructor in inheritance. (d) WAP to demonstrate encapsulation property of OOPs.
Lab 4	(a) Write a program that uses a class where the member functions are defined inside a class. (b) WAP that uses a class where member functions are defined outside a class. (c) WAP that uses a class where member functions are defined inside a class. (d) WAP to demonstrate the use of Static Data members.
Lab 5	(a) WAP to demonstrate the use of Dynamic Constructor. (b) WAP to demonstrate the use of function Template. (c) Illustrate and implement the C++ program to initiate the base constructor from derived class constructor.
Lab 6	(a) Write a C++ program to find the largest and smallest element of an array.
	(b) Create a class Matrix. Implement all possible matrix operations for Matrix type objects by overloading them.
Lab 7	(a) Create 2 classes OM and DB which store the value of distance. DM store distances in meters and cm and DB in feet and inches. Write a program that can read values for the class objects and add 1 object OM with another object of DB.
	(b) Define a class to represent bank account. Include the following members: **Data members** 1. Name of depositor. 2. Account number. 3. Type of account. 4. Balance amount in the account. **Member functions** 1. To assign initial values. 2. To deposit an amount. 3. To withdraw an amount after checking the balance. 4. To display name and balance. Write a main program to test the program.
Lab 8	(a) WAP to demonstrate static class data. (b) WAP to demonstrate the use of Public, Private and protected classes.
Lab 9	(a) WAP to illustrate the concept of call by reference. (b) WAP to illustrate the concept of unary operator overloading. (c) WAP to illustrate the concept of binary operator overloading.
Lab 10	(a) WAP to demonstrate the use of function overloading. (b) WAP using multiple inheritance for collecting employee details.
Lab 11	(a) WAP using function template to find maximum of two Data. (b) WAP to calculate factorial of given number using copy constructor.
Lab 12	(a) WAP to sort five float and integer numbers using template function (use bubble sort). (b) Demonstrate the use of different types of polymorphism.
Lab 13	(a) Write a function to read a matrix of size M × N from keyboard. (b) WAP to implement aggregation concept.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Workshop Practice**	Course Code: **LA1110**
Credit: **1**	L: **0** T: **0** P: **2**
Year: **1st**	Semester: **I / II**

List of Experiments

1. Carpentry: To make a T-Lap joint with soft wood.
2. Arc Welding: To make a Lap joint with mild steel flat by arc welding process.
3. Gas Welding: To make a Lap joint of M.S. sheet with gas welding process.
4. Fitting: To make a plug and socket joint with M.S. flat.
5. Machine Shop: To turn a M.S. rod on lathe to prepare a turning specimen.
6. Sheet Metal: To make a square tray with G.I. sheet.
7. Study of Foundry and Forging tools and equipments

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Electronic Devices and Circuits**	Course Code: **FA3210**
Credit: 4.5	L **3** T **1** P **2**
Year: **2nd**	Semester: **III**

UNIT 1: BIPOLAR JUNCTION TRANSISTORS **10 L**

Transistor as an amplifier, Review of biasing and stabilization, Ebers-Moll model-Derivation of currents, Switching Characteristics of Transistors, Low frequency (h-parameter) models and derivation of parameters for CE. Inter-conversion of low frequency models parameter for CC & CB. High frequency (π- parameter) model, CE short circuit current gain, Miller's Theorem, Gain-bandwidth product.

UNIT 2. FIELD EFFECT TRANSISTORS **8 L**

FET as an amplifier, Biasing of JFET, Hi & Low frequency analysis of FET-Derivation and analysis of parameter for CS. Depletion and Enhancement types of MoSFET, Construction and Working of NMOS & PMOS.

UNIT 3. FEEDBACK AND OSCILLATORS CIRCUITS **8 L**

Concepts & Types of feedback, Different topologies of feedback of shunt and series circuits. Effect of feedback on various parameters. Oscillators circuits & Criteria of oscillation. RC-phase shift, Wein-Bridge, Hartley, Colpitt and Crystal Oscillators.

UNIT 4. MULTISTAGE AMPLIFIER **8 L**

Types of Coupling (RC & TC), Need for Multistage Amplifier, 2-stage amplifier – gain, frequency Analysis, Gain Bandwidth Product (GBW), Darlington Pair, Cascade & Cascode amplifiers.

UNIT 5. POWER AMPLIFIER **10 L**

Amplifier Types, Series Fed and Transformer Coupled Class A Amplifier-operation & Circuit Design, Class B, AB, C,D and S-operation & Circuit Design, efficiency, Amplifier Distortion, Push Pull, complimentary symmetry, second harmonic and cross over Distortion, Thermal stability & Heat Sinking.

Text Books:

1. Jacob Millman& Christos C. Halkias," Electronic Devices and Circuits" Tata McGraw Hill, 1991.

Reference Books:

1. Nandita Das Gupta and Amitava Das Gupta, "Semiconductor Devices-Modelling and Technology", Prentice Hall of India, 2004.
2. Donald A. Neaman."Semiconductor Physics and Devices" 3rd Edition, Tata McGraw Hill, 2002.
3. S Salivahanan, N Suresh Kumar, "Electronic Devices and Circuits", 3rd edition, McGraw Hill Publication, 2013.

Electronic Devices and Circuits Lab

1) To verify switching characteristics of BJT.
2) Find out % error in various gain & impedance of CE, CB.
3) To find out % error in various gain & impedance of CS in JFET/ MOSFET.
4) To verify characteristics of NMOS & PMOS.
5) To Study Positive and Negative feedback circuit using BJT/FET.
6) To verify and realize RC-Phase Shift, Wein Bridge, Hartley &Colpitts ,Crystal Oscillator.
7) To design and verify gain & frequency of Cascade amplifier.
8) To study of Push-Pull amplifiers.
9) To determine the gain & input impedance of Darlington Pair.
10) To Study Class A, transformer coupled amplifiers.

*Any two (Value Added)

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Digital System Design**	Course Code: **FA3221**
Credit: 4.5	L **3** T **1** P **2**
Year: **2nd**	Semester: **III**

UNIT-1: INTRODUCTION **8 L**

Number Systems, Basic & Universal Logic gates, Boolean algebra, Direct Conversion of various base, Negative number representations, Floating point number representation, BCD & EXCESS-3 arithmetic, Error detecting and correcting codes: Hamming code, parity code, Review and Limitation of K-Map, Quine-Mcclusky Method (Tabular Method).

UNIT-2: COMBINATIONAL LOGIC CIRCUITS **8 L**

Characterization of digital circuits: Combinational & Sequential Logic circuit, Design procedure: Adders, Subtractors, Parallel Adder, IC-74LS83 and its applications, Multiplier, Decoder, Encoder, Priority Encoder, Multiplexers, Demultiplexers and their applications, Magnitude Comparators, Code Converters, Parity checker and generator, BCD Adder.

UNIT-3: SEQUENTIAL LOGIC CIRCUITS **6 L**

Latch, Flip-Flops and their conversions, Analysis and Synthesis of Sequential Circuits, Excitation Table & Diagram, Counters: Synchronous & Asynchronous, Shift Registers and their applications, Finite State Machine: Mealy and Moore Models.

UNIT-4: MEMORIES **8 L**

Memory Characteristics and operations , Sequential, Random Access-MOS & C-MOS Static and Dynamic Memory elements, Memory organization: One dimensional and Multidimensional Arrangement, Read Only Memory, ROM as a Decoder, Memory Bank, Address Decoding of Memory (Internal & External), PAL, PLA.

UNIT-5: LOGIC FAMILIES, HAZARDS & FAULT DETECTIONS **10 L**

Logic Families: Diode, BJT & MOS as a switching element, concept of transfer characteristics, ECL, TTL, I2L, Tri-state, PMOS,NMOS and CMOS logic families- Power Consumption, Gate delay and Figure of merit (SPP),Package density, Comparison of standard logic families, pass transistor Logic, Open Collector and Totem pole output stage for TTL. Static and Dynamic Hazards, Gate Delay, Generation of Spikes, Analysis & illustration of Hazard in Combinational Circuits, fault Detection Techniques: Path Sensitization, Boolean Difference Method, K- Map Method.

Text Books:

1. Digital Design, M. Morris Mano and M. D. Ciletti, 4th Edition, Pearson

Reference Books:

1. Digital Systems: Principles and Design, Raj Kamal, Pearson
2. Maini, Digital Electronics: Principles and Integrated Circuits, Wiley India.
3. Switching Theory and Finite Automata, Kohavi, TMH Publications.

Digital System Design Lab

1. Implementation of All Logic Gates using Universal gates (NAND & NOR both).
2. Bread-board implementation (Parallel adder, One bit Multiplier, One bit Magnitude comparator, parity checker)
3. Bread-board implementation of any one code converter (i.e. Gray Code, BCD Code, Excess-3, Hex. etc.).
4. Design of shift registers (SISO, SIPO, PIPO, and PISO), up and down counters.
5. Design of Mod-6 types of Asynchronous Counters.
6. Transfer characteristics of TTL and CMOS inverters.
7. Realization of Decoder, Multiplexer, encoder and De-multiplexers using IC 74138.
8. To design & Implement PAL.
9. To design & implement PLA.
10. Clock circuit realization using 555, CMOS inverter.

*Any two (Value Added)

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **DATA STRUCTURES**	Course Code: **DA3210**
Credit: 4	L **3** T **0** P **2**
Year: **2nd**	Semester: **III**

Unit I : **Introduction:** Concept of data structure, Types of data structures, Character String in C, Recursion, Structure, Pointer, Dynamic Allocation, Algorithms, Algorithm analysis, Complexity of algorithms and Time space trade-off.

Arrays: Introduction, Single and multi-Dimensional Arrays, address calculation, application of arrays, Operations defined: traversal, insertion and deletion.

Stacks: Stacks, Array representation of stack, Applications of stacks, Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack.

Unit II : **Queue:** Queue, Array representation and implementation of queues, Circular queues, Operations on Queue: Create Add, Delete, and Full and Empty, De-Queue, Priority queues, Applications of Queues.

Linked Lists: Concept of linked list, Representation and implementation of singly linked list, Circular linked list, doubly linked list, Operations on Linked lists, Concepts of header linked lists, applications of linked lists.

Unit III : **Trees:** Basic terminologies of trees, Binary tree, Complete Binary tree, Extended Binary tree, Representation of Binary tree, Binary tree traversal, Operations on Binary tree.

Binary Search Tree: Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, B-trees.

Unit IV : **Graphs:** Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Representations of Graphs, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.

Unit V : **Searching** & **Hashing:** linear search, binary search, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.

Sorting: Bubble sort, Insertion sort, Selection sort, Quick sort, Merge sort, Heap Sort.

File Handling: Introduction to file handling, Data and Information, File concepts, File organization, files and streams, working with files.

Text Book:

1. Lipschutz, "Data Structures" Schaum's Outline Series, TMH.
2. A. M. Tenenbaum, Langsam, Moshe J. Augentem, Data Structures using C PHI Pub.

Reference Book:

1. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication.
2. Robert Kruse, Data Structures and Program Design in C PHI.
3. Willam J. Collins, Data Structure and the Standard Template library –2003, T.M.H.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Electromagnetic Field Theory**	Course Code: **FA3021**
Credit: 3.5	L T P **3 1 0**
Year: **2nd**	Semester: **III**

UNIT 1: COORDINATE SYSTEMS AND TRANSFORMATION **6L**

Cartesian Coordinates, Circular Cylindrical Coordinates, Spherical Coordinates Vector Calculus: Differential Length, Area and Volume, Line Surface and Volume Integrals, Del Operator, Gradient of a Scalar, Divergence of a Vector and Divergence Theorem, Curl of a Vector and Stoke's Theorem, Laplacian of a Scalar.

UNIT 2: ELECTROMAGNETIC WAVE PROPAGATION **8L**

Faraday's Law, Transformer and Motional Electromotive Forces, Displacement Current, Derivation of Maxwell's Equations For Static and Time-Varying Fields. Differential and integral forms, concept of displacement current. Boundary conditions.

UNIT 3: ELECTROMAGNETIC WAVE PROPAGATION APPLICATIONS **8L**

Electromagnetic Wave Propagation: Wave Propagation in Lossy Dielectrics, Plane Waves in Lossless Dielectrics, Plane Wave in Free Space, Plain Waves in Good Conductors, Power and The Poynting Vector, Reflection of a Plane Wave in a Normal incidence.

UNIT 4: TRANSMISSION LINES **8L**

Transmission Lines: Transmission Line Parameters, Transmission Line Equations, Input Impedance, Standing Wave Ratio and Power, Smith Chart, Some Applications of Transmission Lines. Time & Frequency Domain analysis of Transmission lines. Low loss RF and UHF transmission lines. Distortion-less condition. Transmission line charts-impedance matching.

UNIT 5: WAVEGUIDES **8L**

Wave Guides: Introduction to Planar (Rectangular) Waveguides, Derivation of TE and TM Modes, TEM Mode. Circular Waveguides- Derivation of TE and TM Modes, TEM Mode. Impedance and characteristics impedances. Transmission line analogy for wave guides. Attenuation and factor of wave guides. Dielectric slab wave guides. Resonators

Text Books:

1. Elements of Electromagnetics, M N O Sadiku, 2012.

Reference Books:

1. Engineering Electromagnetic, William Hayt, McGraw-Hill, 2011.
2. Electromagnetic Fields, K. D. Parsad, 2010.
3. Electromagnetic waves and radiating systems. Edward Conrad Jordan, Keith George Balmain. Prentice-Hall, 1996.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Signals and Systems**	Course Code: **FA3030**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **2nd**	Semester: **III**

A: CONTINUOUS-TIME (CT) SIGNAL AND SYSTEM ANALYSIS

UNIT 1: TIME-DOMAIN ANALYSIS OF LTI CT SYSTEMS 8 L

Properties of Signals, Definition of a CT system, CT system properties, Differential Equation, Impulse response and the convolution integral, Properties of convolution, Differential Equation, System properties in terms of the impulse response, System Response for Complex-Exponential Inputs.

UNIT 2: FREQUENCY DOMAIN ANALYSIS OF CT SIGNALS AND LTI SYSTEMS 10 L

Laplace Transform (LT)-RoC, Properties and Applications. Fourier Series (FS)-Exponential FS and its properties, Fourier Transform (FT): Definition, Relation to Laplace transform and FS, Properties, Examples, Frequency Spectra, Frequency Response of LTI systems, Applications of the Fourier Transform (Ideal Filters, Amplitude Modulation)

B: DISCRETE-TIME (DT) SIGNAL AND SYSTEM ANALYSIS

UNIT 3: BASIC DT SIGNAL AND SYSTEM CONCEPT 6 L

Definition of a DT signal, Sampling Theorem, DT signal properties, Energy vs. Power signals, Periodic vs. Aperiodic, Even and odd signals, Operations on signals, Special signals: Harmonics, Singularity signals; Definition of a DT system, DT system properties.

UNIT 4: TIME DOMAIN ANALYSIS OF LTI DT SYSTEMS 6 L

Difference equation representation of I/O relationship, Impulse response and the convolution sum, System properties in terms of the impulse response, System response for complex-exponential inputs.

UNIT 5: FREQUENCY DOMAIN ANALYSIS OF DT SIGNALS AND SYSTEM 10 L

Z-transform: Definition, existence and motivation, Evaluation of ZT, Properties, Inverse ZT, LTI System Applications (transfer functions) Fourier transforms of discrete-time signals: Discrete-Time Fourier Series, Discrete-Time Fourier Transform - Definition, Relationship between DTFT and z-transform, Relationship between DTFT and CTFT, Properties, Frequency response of DT LTI systems

Text Books:

1. Linear Systems and Signals, B. P. Lathi, Oxford Press, 2nd Edition. Reference Learning:
2. Signals and Systems, Oppenheim and Willsky with Nawab, 2ndEdition, Prentice Hall, 1997.
3. Signals and Systems, Tarun Kumar Rawat, 1st Edition, Oxford University Press, 2011

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Network Analysis and Synthesis**	Course Code: **EA32F0**
Credit: 4.5	L T P **3 1 2**
Year: **2nd**	Semester: **III**

UNIT 1. INTRODUCTION TO CONTINUOUS TIME SIGNALS AND SYSTEMS:
Basic continuous time signals, unit step, unit ramp, unit impulse and periodic signals with their mathematical representation and characteristics. Waveform synthesis, Analogous System: Linear mechanical elements, force-voltage and force-current analogy, modelling of mechanical and electro-mechanical systems

UNIT 2. GRAPH THEORY:
Graph of a Network, definitions, tree, co tree , link, basic loop and basic cut set, Incidence matrix, cut set matrix, Tie set matrix Duality, Loop and Node methods of analysis. Analysis of first and second-order linear systems by classical method.

UNIT 3. NETWORK THEOREMS (APPLICATIONS TO AC NETWORKS):
Superposition Theorem, Thevenin's Theorem, Norton's Theorem, maximum power transfer theorem, Concept of Duality. Network Functions : Concept of Complex frequency, Transform Impedances Network functions of one port and two port networks, concept of poles and zeros, properties of driving point and transfer functions, time response and stability from pole zero plot.

UNIT 4. TWO PORT NETWORKS:
Characterization of LTI two port networks ZY, ABCD, h and g-parameters, reciprocity and symmetry, Inter-relationships between the parameters, inter-connections of two port networks, Ladder and Lattice networks. T & ∏ Representation.

UNIT 5. NETWORK SYNTHESIS :
Positive real function; definition and properties; properties of LC, RC and RL driving point functions, synthesis of LC, RC and RL driving point admittance functions using Foster and Cauer first and second forms. Introduction to active network synthesis.

Text Books:

1. Kuo, Network Analysis & Synthesis, Wiley India
2. ME Van-Valkenberg; "Network Analysis", Prentice Hall of India

Reference Books:

1. Jagan, Network Analysis, B S Publication
2. ChoudharyD.Roy, "Network & Systems", Wiley Eastern Ltd.
3. Donald E.Scott, "Introduction to circuit Analysis" Mc. Graw Hill
4. B.P. Lathi, "Linear Systems & Signals" Oxford University Press, 2008

Network Analysis & Synthesis Lab: List of Experiments

1.Verification of Superposition Theorem, Thevenin's Theorem, Norton's theorem, Maximum power transfer theorem
2.To plot frequency response of a series resonant circuit.
3.To plot frequency response of a parallel resonant circuit.
4.To measure input impedance and output impedance of a given two port network.
5.To design a ∏ attenuator which attenuate given signal to the desired level.
6.Verification of Superposition Theorem, Thevenin's Theorem, Norton's theorem, Maximum power transfer theorem using Multisim/Pspice.
7.Plot the frequency response of a series resonant circuit using Multisim/Pspice.
8.Plot the frequency response of a parallel resonant circuit using Multisim/Pspice.
9.Measure input impedance and output impedance of a given two port network using Multisim/Pspice..
10.Design a ∏ attenuator which attenuate given signal to the desired level using Multisim/Pspice.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Computer Aided Design of Electronics Lab**	Course Code: **FA3110**		
Credit: 1	L	T	P
	0	**0**	**2**
Year: **2nd**	Semester: **III**		

List of Experiments

1. Introduction to PSpice&Orcad.

2.To calculate the ripple factor of Full Wave rectifier with and without filters. (Write a Pspice code)

3.To verify the characteristics of CE amplifier. (Write a Pspice code)

4.Write a Pspice code for all the logic gates.

5.Write a Pspice code of 2-to-4 decoder

6.Write a Pspice code of 8-to-3 encoder (without and with priority)

7.Write a Pspice code of 8-to-1 multiplexer

8.Write a Pspice code of 4 bit Binary to Gray code converter

9.Write a Pspice code of Multiplexer/ Demultiplexer , comparator

10.Write a Pspice code of Full Adder using 3 modeling styles

11.Write a Pspice code of Flip Flops: SR, D, JK,T (Asynchronous Reset and Synchronous Reset)

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Digital Signal Processing**	Course Code: **FA4211**
Credit: 4.5	L: **3** T: **1** P: **2**
Year: **2nd**	Semester: **IV**

UNIT-1: DISCRETE FOURIER TRANSFORM **8 L**

Frequency Domain Sampling: The Discrete Fourier Transform, Frequency Domain Sampling and Reconstruction of Discrete-Time Signals, Discrete Fourier Transform (DFT), Properties of DFT, DFT as a linear Transformation. Relationship of the DFT to Other Transforms, Multiplication of two DFTs and Circular Convolution, Additional DFT Properties, Frequency analysis of signals using the DFT.

UNIT-2: FAST FOURIER TRANSFORM: AN EFFICIENT COMPUTATION OF DFT **8 L**

Efficient Computation of the DFT: FFT Algorithms, Computational Complexity of Direct Computation of the DFT, Radix-2 FFT algorithms. Efficient computation of the DFT of two real sequences, efficient computation of the DFT of 2N-Point real sequences, Linear Filtering Approach to computation of the DFT (Geortzel & Chirp-z Transform algorithms) Quantization effects in the computation of DFT.

UNIT-3: IMPLEMENTATION OF DISCRETE-TIME SYSTEMS **8 L**

Structures for the realization of Discrete-Time Systems: Structure of FIR filters, Direct form, Cascade form, Frequency sampling structures, lattice structures. Structures for the realization of Discrete-Time Systems: Direct form, Signal flow graphs and transposed structures, Cascade form, Parallel form, Lattice and Latice ladder Structures.

UNIT-4: DESIGN OF FIR FILTERS **10L**

Causality and its implications, Characteristics of Practical Frequency selective filters. Design of FIR Filters: Symmetry and Anti-symmetry FIR filters, Designing of FIR linear phase FIR filters using Windows, Designing of FIR linear phase FIR filters using frequency sampling method, Design of optimum Equiripple Linear phase FIR filters, Design of FIR differentiators, Design of Hilbert Transformers, Comparison of Design methods for linear phase FIR filters.

UNIT-5: DESIGN OF IIR FILTERS **8 L**

Design of IIR Filters from Analog Filters: Designing of IIR filters by approximation of derivatives, impulse invariance method, IIR filter Design by Bilinear Transformation, Characteristics of commonly used analog filters (Butterworth and Chebyshew filters),Frequency Transformations: Frequency Transformation in the analog domain and in the frequency domain.

Text Books:

1. Proakis, J.G. &Manolakis, D.G., "Digital Signal Processing: Principles Algorithms and Applications", PHI.
2. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice- Hall India.

Reference Books:

1. Rabiner, L.R. and Gold B., "Theory and applications of DSP", PHI.
2. Thomas J, Cavichhhi, "Digital Signal Processing", John Wiley & Sons
3. Roman KUC, Digital Signal Processing, BSP Hyderabad
4. Apte, "Digital Signal Processing", 2nd Edition, John Wiley (India), 2009.
5. Roman Kuc "Introduction to Digital signal Processing" BSP, Hydrabad.

Digital Signal Processing Lab

1. Code Composer Studio (CCS) introduction, aliasing, quantization, data transfers, guitar distortion
2. CCS, sinusoids, wavetables, AM/FM, ring modulators, tremolo
3. Delays, circular buffers, FIR filters, voice scrambler
4. FIR filtering experiments (software lab)
5. Digital audio effects, reverb, multi-delay, guitar strings, flangers, vibrator
6. IIR filtering experiments (software lab)
7. Verify the Symmetry, time shifting and modulating properties of DTFT with a rectangular pulse of length 21.
8. Study the aliasing effect by using a Sinusoidal Signal. Show the plots of' continuous time Signal. Sampled Signal and reconstructed signals by using subplot.
9. Study different window functions available in signal processing toolbox and their Controlling parameters.
10. Write a program to plot real, imaginary phase and magnitude of exponential function.
11. Verify the properties of Discrete Fourier Transform (DFT).
12. Write a program to find the convolution of two sequences.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Analog Integrated Circuits**	Course Code: **FA4220**
Credit: 4.5	L T P **3 1 2**
Year: **2nd**	Semester: **IV**

UNIT 1: Introduction to Operational Amplifier **8 L**

Ideal and practical op-amps, Modes of operation- inverting, non-inverting IC-741 op-amp and its features, CMRR, Slew Rate, PSRR Basic op-amp applications: Summer, Differential, Integrator, Differentiator and Voltage follower, Practical Differentiator and Integrator, Op-amp characteristics (DC & AC) .

UNIT 2: Operational Amplifier Analysis **8 L**

Operational amplifier internal circuit, Differential amplifier analysis, Transfer characteristics, low frequency small signal analysis of differential amplifier, Circuit for improving CMRR, Current mirrors, Current repeaters, Input resistance, Active load, Level translator with output stage, Multipliers: Two & Four quadrant (Gilbert Cell).

UNIT 3: Operational Amplifier Applications **10 L**

Instrumentation amplifier, V to I and I to V converters, Op-amp circuits using diode, Sample and hold circuit, Log and Anti-log amplifier, OTA.Non-linear Application of Operational Amplifier: Comparators and its applications, Schmitt Trigger Waveform generators: Square wave (Astable Multivibrator), Monostable Multivibrator, Triangular wave.

UNIT 4: Active Filters **8 L**

Low pass and High Pass Active Filters (First order and Second order), Band Pass Filters (Narrow Band & Wide Band), Band Rejected Filter, State Variable Filter, Filter Transformation, Active Filter using OTA.

UNIT 5: Timers, Converters and PLL **10 L**

Introduction of IC- 555 Timer: Functional diagram and operations (Monostable & Astable), Applications of IC-555 timer (in Monostable and Astable Mode): Linear ramp Generator, Frequency divider, PWM, FSK Generator and Detector. Integrated Circuit Applications: PLL and its applications, A-D and A-D Converters, 723 General Purpose Regulators.

Text Books:

1. D.Roy Choudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd., 2000
2. Ramakant A. Gayakwad, 'OPAMP and Linear IC's', Prentice Hall / Pearson Education, 1994.
3. Sergio Franco, 'Design with operational amplifiers and analog integrated circuits', McGraw-Hill, 1997.

Reference Books:

1.Gray and Meyer, 'Analysis and Design of Analog Integrated Circuits', Wiley International, 1995.
2. Millman J. and Halkias C.C. 'Integrated Electronics', McGraw-Hill, 1972
3. William D.Stanely, 'Operational Amplifiers with Linear Integrated Circuits'. Pearson Education, 2004.

Analog Integrated Circuits Lab

1. To study OP-AMP as adder and sub tractor circuits(IC- 741).
2. To study clipping circuits using OP-AMP(IC-741).
3. To study clamping circuits using OP-AMP(IC-741).
4. To study OP-AMP as Schmitt trigger(IC-741).
5. To study an instrumentation amplifier using OPAMP(IC-741).
6. Study of current to voltage and voltage to current converter using OP-AMP(IC-741).
7. To study Astable multivibrator circuit using timer IC-555.
8. To study monostable multivibrator circuit using timer IC-555.
9. To study Voltage Controlled Oscillator using timer IC-555.
10. To study Frequency divider using IC-555.
11. To design 2nd order low pass butterworth filter.
12. To design 2nd order high pass butterworth filter.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Principles of Antenna & Wave Propagation**	Course Code: **FA4010**
Credit: 3.5	L T P **3 1 0**
Year: **2nd**	Semester: **IV**

UNIT 1: FIELD RADIATIONS & ANTENNA PARAMETERS **10L**

Radiation: Review of electromagnetic fields, Displacement current, Maxwell's equations in free space, plane wave & uniform plane wave in free space. Electromagnetic radiations, Physical concept of radiation, Retarted potential, monopole and a half wave dipole.

UNIT 2 : PARAMETER MEASUREMENTS **10 L**

Antenna Parameters : Introduction, Isotropic radiators, Radiation pattern, Gain, Directive gain, Directivity, Reciprocity theorem & its applications, effective aperture, radiation resistance, antenna beam width, antenna bandwidth, antenna beam efficiency, antenna beam area or beam solid angle. Antenna measurement: Measurements of antenna efficiency, Measurement of noise figure and noise temperature of an antenna polarization measurement.

UNIT 3: ANTENNA ARRAYS **8 L**

Antenna Arrays: Introduction, various forms of antenna arrays, arrays of point sources, non- isotropic but similar point sources, multiplication of patterns, arrays of n-isotropic sources of equal amplitude and spacing (Broad-side & End-fire array cases), array factor, directivity and beam width, array of n-isotropic sources of equal amplitude and spacing end-fire array with increased directivity, scanning arrays, Dolph-Tchebysceff arrays, tapering of arrays, binomial arrays, continuous arrays, rectangular arrays, superdirective arrays.

UNIT 4: PRACTICAL ANTENNAS **8 L**

Practical Antennas: Aperture Antennas, loop antennas, slot radiators, scanning antennas, signal processing antennas, travelling wave antennas, Smart Antennas. long wire antenna, V-antenna, Rhombic antenna, Folded dipole antenna, Yagi-Uda antenna, and helical antenna, slot antenna, microstrip or patch antennas, and turnstile antenna, frequency independent antennas, and microwave antennas.

UNIT 5: FREE SPACE WAVE PROPAGATION **6 L**

Wave Propagation: Introduction, structure of atmosphere, basic idea of ground wave, surface wave, and space wave propagation, tropospheric propagation and duct propagation.

Text Books:

1. Krauss J D, "Antennas", 4th edition, McGraw - Hill Inc., New York (1991).

Reference Books:

1. Prasad K D, "Antenna and Wave Propagation", 3rd edition, Satya Prakashan, New Delhi (1996).
2. Stutzman W L, Thieele G A, "Antenna Theory and Design", 2nd Ed., Wiley (1997)

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Computer Organization and Microprocessors**	Course Code: **FA4021**
Credit: 3.5	L T P **3 1 0**
Year: **2nd**	Semester: **IV**

UNIT-I Memory Organization **8L**

history of computers, Introduction to Microprocessor, Tristate devices, buffers, encoder, decoder, latches, Internal memory, semiconductor main memory, cache memory, DRAM organization, associate memory organization, Magnetic disk, CDROM, magnetic tape, memory management, memory hierarchy, partitioning, paging, virtual memory.

UNIT – II Computer Arithmetic & Processor Organization **7L**

Von Neumann Machine, computer components, functions, bus inter connection, ALU, integer arithmetic, addition, subtraction, multiplication and division, floating point arithmetic, Machine Instruction set, types of operands, types of operations, addressing modes, instruction formats, processor organization.

UNIT-III 8085 Microprocessor & Control Design **10L**

8085 Microprocessor Organization, assembly language programming of 8085, Addressing Modes, 8085 Instruction Set, 8085 interrupts, processor control unit, operation, micro-operations, hardwired control, micro program control, horizontal and vertical micro instructions, micro instruction sequencing and execution, nanoprogramming, Applications of Microprogramming.

UNIT-IV I/O Peripheral Interfacing **8L**

Memory interfacing, I/O interfacing Devices- 8255A PPI, 8253/8254 Timer, 8259A PIT, 8237 DMA Controller, and Serial I/O Concepts 8251A USART. Interfacing of above chips with 8085, Programming them In Deferent Modes.

UNIT - V 8086 Microprocessor **7L**

Architecture of 8086, block diagram, register set, flags, Queuing, concept of segmentation, Pin description, operating modes, addressing modes.

Text Books:

1. "Microprocessor Architecture, Programming, and Applications with the 8085" Ramesh S. Gaonkar, Penram International
2. "Computer Organization and Architecture" William Stalling, 4th Edition, PHI.
3. "Microprocessors and Interfacing: Programming and Hardware", Douglas V. Hall, Tata McGraw Hill Edition.

Reference books:

1. "Computer Architecture and Organization" Hayes, MH.
2. "Computer System Architecture", M. Morris Mano, Prentice-Hall of India, Pvt. Ltd., Third edition.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Probability Theory, Random Variable and Stochastic Process**	Course Code: **JA4010**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **2nd**	Semester: **IV**

UNIT 1:

Theory of Probability & Concept of Random Variable

Axioms of probability: set theory, probability space, conditional, probability. Introduction, distribution and density functions, specific random variables, conditional distributions.

UNIT 2 :

Multiple Random Variables

Bi-variate distributions, one function of two random variables, two functions of two random variables, joint moments, joint characteristic functions, conditional distributions Multiple random variables, sequences of random variables

UNIT 3:

Concept of Stochastic Processes & Random Walks and Other Applications

Definition, systems with stochastic inputs, power spectrum, discrete-time processes. Random walks, Poisson points and shot noise, cyclo-stationary Processes, band-limited processes and sampling theory, deterministic signals in noise.

UNIT 4:

Spectral Representation and Estimation & Mean Square Estimation

Factorization and innovations, finite-order systems and state variables, spectral representation of random processes, ergodicity, spectrum estimation. Prediction, filtering and prediction, Kalman filters. Entropy: Basic concepts, random variables and stochastic processes, MEM.

UNIT 5:

Markov Chain & Queuing Theory

Introduction, higher transition probabilities and the Chapman-Kolmogorov equation, classification of states, stationary distributions and limiting probabilities, transient states and absorption probabilities, branching processes. Markov processes.

Characteristics of Queuing Theory, Queuing Models, Birth & Death Process, Little's Theorem.

Text Books:

1. Probability, Random Variables and Stochastic Processes/A. Papoulis & S. U. Pillai / 4th ed./TMH

Reference Books:

1. Probability, Random Variables & Random Signal Principles/Peyton Z. Peebles, Jr. / TMH
2. Probability & Queuing Theory, R. H. Chitale, Technical Publication Pune

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **VLSI Technology**	Course Code: **FA4030**
Credit: 3.5	L T P **3 1 0**
Year: **2nd**	Semester: **IV**

UNIT 1: CRYSTAL GROWTH AND WAFER PREPARATION 8 L

Crystal Growth: MGS, EGS, Czochralski crystal Growing: Crystal structure, crystal growing theory, CZ crystal puller, Silicon shaping, Wafer Preparation, processing considerations: chemical cleaning and gettering treatment Epitaxy: Epitaxy and its concept, Growth kinetics of epitaxy, Vapor Phase Epitaxy, Sputtering, MBE, epitaxial evaluation.

UNIT 2: OXIDATION AND DIFFUSION 10 L

Oxidation: Growth mechanism and kinetics, Silicon oxidation model, Oxidation Techniques: Dry Oxidation and wet oxidation, Plasma Oxidation, High pressure Oxidation, Oxide Properties and Oxidation induced defects. Diffusion Process: Diffusion models of solid, Fick's theory of diffusion, Solution of Fick's law, Ion implantation- Scattering phenomenon, range theory, channeling, implantation damage, Annealing

UNIT 3: LITHOGRAPHY AND ETCHING 8 L

Lithography: Photolithography, E-beam lithography, X-ray Lithography Etching: Dry and wet etching, Reactive Plasma Etching: Plasma Properties, Feature Size control and anisotropic etching: Pattern transfer, Ion enhanced and ion induced etching, Reactive ion etching and its damages.

UNIT 4: METALLIZATION AND VLSI PROCESS INTEGRATION 8 L

Metallization: Applications and choices, physical vapor deposition, patterning, problem areas VLSI Process Integration: Bipolar IC fabrication Process Sequence, MOS IC fabrication Process Sequence, CMOS IC fabrication Process Sequence

UNIT 5: PACKAGING AND YIELD LOSS 8 L

Assembly Technique and Packaging: Package types, packaging design consideration, VLSI assembly technologies. Yield and Reliability: Yield loss in VLSI, yield loss modelling, reliability requirements, accelerated testing: temperature, humidity, voltage and current

Text Books:

1. S.M. Sze (Ed.) "VLSI Technology " M Hill. 1988

Reference Books:

1. S.K. Ghandhi, "VLSI Fabrication Principles", Jhon Wiley
2. S.A. Campbell "The Science and Engineering of Microelectronic Fabrication", Oxford University Press

Course Title: **Minor Project of CAD Lab**	Course Code: **FA4110**
Credit: 1	L T P **0 0 2**
Year: **2nd**	Semester: **IV**

Engineering students use this space for computer-aided design, modeling, parametric analysis, and prototyping (Hardware) which facilitates them to work in team environment on engineering design projects as a part of various courses they studied so far.

Course Title: **Value Addition Training**	Course Code: **FA4310**
Credit: 1	L T P **0 0 2**
Year: **2nd**	Semester: **IV**

COMPOTIA A+ 220-801 covers the fundamentals of computer technology, installation and configuration of PCs, laptops and related hardware, and basic networking.
COMPOTIA A+ 220-802 covers the skills required to install and configure PC operating systems, as well as configuring common features (e.g. network connectivity and email) for mobile operating systems Android and Apple iOS.

Course Title: **Industrial Tour**	Course Code: **FA4410**
Credit: 1	L T P **0 0 2**
Year: **2nd**	Semester: **IV**

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Principles of Communication Engineering**	Course Code: **FA5210**
Credit: 4.5	L T P **3 1 2**
Year: **3rd**	Semester: **V**

UNIT 1: Introduction **10 L**

Communication system, Analog and Digital Messages, channel bandwidth, redundancy, a periodic representation of Fourier Integral transforms of some useful signals, modulation and demodulation. Signal Transmission through a Linear System, Ideal and Practical Filters, Signal Distortion over a Communication Channel, Signal Energy and Energy Spectral Density, Signal Power and Power Spectral Density, Types of noise in Communication systems

UNIT 2: Amplitude Modulation **12 L**

Baseband and carrier communication, Amplitude modulation-DSB, Amplitude Modulation (AM) Quadrature Amplitude Modulation (QAM),Amplitude Modulation: Single Sideband (SSB),Amplitude Modulation: Vestigial Sideband (VSB),Carrier Acquisition, TRF & Super heterodyne AM Receiver, Receiver characteristics, Behavior of Baseband Systems , Amplitude-Modulated Systems in presence of noise

UNIT3: Angle Modulation **8 L**

Concept of Instantaneous Frequency, Bandwidth of Angle-Modulated Wave ,Generation of FM Waves, Demodulation of FM using PLL, Costas Loop ,Interference in Angle-Modulated Systems, FM Receiver, Super heterodyne FM Receiver Behavior of Frequency Modulated Systems in presence of noise, Optimum Pre emphasis-De emphasis System

UNIT 3: Analog Pulse Modulation **8 L**

Sampling Theorem for Low pass and Band pass signals, Aliasing. Sampling Techniques: principle, generation, demodulation, spectrum. PAM, PWM, PPM – generation and detection, Behavior of Pulse Modulated Systems in presence of noise

UNIT 5: Concepts of PCM &Digital Transmission **6 L**

Quantization, Quantization error, non-uniform quantizing, encoding, Introduction to the concept of Pulse-Code Modulation, A Digital Communication System, Scrambling ,Regenerative Repeater, Detection-Error Probability , M-ary Communication, Digital Carrier Systems , Multiplexing techniques

Text Books:

1. Wayne Tomasi, Electronic Communication Systems, Pearson Education 3rd Edition, 2001.
2. B.P. Lathi, Modern Analog and Digital Communication systems, Third edition.

Reference Books:

1. Herbert Taub and Donald Schilling, Principles of Communication Systems, Tata McGraw Hill, 2nd Ed.
2. Simon Hykins Communication Systems, Wiley Jhon
3. William Stanley, Electronic Communication: Principles & Systems, Cenga

Communication Engineering Lab

1.To generate amplitude modulated wave and determine the percentage modulation and Demodulate the modulated wave using envelope detector.
2.To generate AM-Double Side Band Suppressed Carrier (DSB-SC) signal.
3.To generate the SSB modulated wave.
4.To generate frequency modulated signal and determine the modulation index andbandwidth for various values of amplitude and frequency of modulating signal and to demodulate a Frequency Modulated signal using FM detector.
5.To observe the effects of pre-emphasis on given input signal and to observe the effects of De-emphasis on given input signal.
6.To generate the Pulse Amplitude modulated and demodulated signals.
7. To generate PWM and PPM.
8. To construct the frequency division multiplexing and demultiplexing circuit and to verify its operation.
9.To design and obtain the characteristics of a mixer circuit.
10.To study about detection of AM demodulator (or) Synchronous Demodulator
11.To study phase lock loop and its capture range, lock range and free running VCO.
12.To study the AGC Characteristics

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Microwave Engineering**	Course Code: **FA5221**
Credit: 4.5	L T P **3 1 2**
Year: **3rd**	Semester: **V**

UNIT 1: TWO PORT RF NETWORKS-CIRCUIT REPRESENTATION 8 L

Low frequency parameters-impedance, admittance, hybrid and ABCD. High frequency parameters-Formulation of S parameters, properties of S parameters-Reciprocal and lossless networks, transmission matrix, Introduction to component basics, wire, resistor, capacitor and inductor, applications of RF

UNIT 2. RF TRANSISTOR AMPLIFIER DESIGN AND MATCHING NETWORKS 8L

Amplifier power relation, stability considerations, gain considerations noise figure, impedance matching networks, frequency response, T and Π matching networks, microstripline matching networks.

UNIT 3. MICROWAVE PASSIVE COMPONENTS 8L

Microwave frequency range, significance of microwave frequency range - applications of microwaves. Scattering matrix -Concept of N port scattering matrix representation- Properties of S matrix- S matrix formulation of two-port junction. Microwave junctions - Tee junctions -Magic Tee - Rat race - Corners - bends and twists - Directional couplers - two hole directional couplers- Ferrites - important microwave properties and applications – Termination - Gyrator- Isolator-Circulator - Attenuator - Phase changer – S Matrix for microwave components – Cylindrical cavity resonators.

UNIT 4: MICROWAVE SEMICONDUCTOR DEVICES 12L

Microwave semiconductor devices- operation - characteristics and application of BJTs and FETs -Principles of tunnel diodes - Varactor and Step recovery diodes - Transferred Electron Devices -Gunn diode- Avalanche Transit time devices- IMPATT and TRAPATT devices. Parametric devices -Principles of operation - applications of parametric amplifier .Microwave monolithic integrated circuit (MMIC) - Materials and fabrication techniques, HEMT.

UNIT 5. MICROWAVE TUBES AND MEASUREMENTS 8 L

Microwave tubes- High frequency limitations - Principle of operation of Multicavity Klystron, Reflex Klystron, Traveling Wave Tube, and Magnetron. Microwave measurements: Measurement of power, wavelength, impedance, SWR, attenuation, Q and Phase shift.

Text Books :

1. Samuel Y Liao, “Microwave Devices & Circuits” , Prentice Hall of India, 2006.
2. Reinhold Ludwig and PavelBretshko ‘RF Circuit Design”, Pearson Education, Inc.,2006

References Books:

1. Robert. E. Collin-Foundation of Microwave Engg –McGraw Hill.
2. Annapurna Das and Sisir K Das, “Microwave Engineering”, Tata McGraw Hill Inc., 2004.
3. M.M. Radmanesh , RF & Microwave Electronics Illustrated, Pearson Education, 2007.
4. Robert E. Colin, 2ed “Foundations for Microwave Engineering”, McGraw Hill, 2001
5. D.M. Pozar, “Microwave Engineering.”, John Wiley & sons, Inc., 2006.

Microwave Engineering Lab

1. Gunn Diode Characteristics
2. Reflex Klystron Characteristics
3. Attenuation Measurement
4. VSWR Measurement
5. Waveguide Parameters Measurement
6. Impedance and Frequency Measurement
7. Scattering Parameters of Magic Tee
8. Directional Coupler Characteristics
9. Radiation Pattern of Horn Antenna
10. Characterization of LED
11. Characterization of Laser Diode
12. Measurement of NA for optical fiber cable
13. Measurement of losses for Analog Optical Link

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Advanced Microprocessors & Microcontrollers**	Course Code: **FA5231**
Credit: 4.5	L: **3** T: **1** P: **2**
Year: **3rd**	Semester: **V**

UNIT-I 32-BIT MICROPROCESSOR 8 L

80386 Micro Processors: Review of 8086, Salient features of 80386, Architecture and Signal Description of 80386, Register Organization of 80386, Addressing Modes. Data Types of 80386, Real Address mode of 80386, Protected mode of 80386, Segmentation Paging, Virtual 8086 Mode, Enhanced Instruction set of 80386, the Co-processor 80387.

UNIT-II PENTIUM PROCESSORS 8 L

Salient features of Pentium 4, Instruction Translation for Pentium 4, Instruction Translation Look aside Buffer and Branch Prediction, Rapid Execution Module, Memory Subsystem, Hyper threading Technology Hyper threading in Pentium, Extended Instruction set in Advanced Pentium Processors, Instruction Set.

UNIT-III 8051 MICROCONTROLLER 8 L

Introduction to Microcontrollers: Overview of 8051 microcontroller, Architecture, I/O Ports, Memory organization, addressing modes and instruction set of 8051, progranming.8051 Real Time Control: Interrupts, timer/Counter and serial communication, programming Timer Interrupts, programming external hardware interrupts, programming the serial communication interrupts, programming 8051 timers and counters

UNIT IV: AVR MICROCONTROLLER 8 L

The AVR RISC microcontroller architecture: Introduction, AVR Family architecture, Register File, The ALU, Memory access and Instruction execution,. I/O memory, EEPROM, I/O ports, Timers, UART, Interrupt Structure

UNIT-V PLC MICROCONTROLLER 8 L

Introduction, Architectural Overview, Memory Organization, Data Memory and Flash Memory, Interrupts and Reset, 1/O Ports, Timer, Analog to Digital I/O, I2C Interfacing –UART, PWM and introduction to C-Compilers.

Reference Books:

1. A.K.Ray, K.M. Bhurchandi, "Advanced Microprocessors and Peripherals", 2nd Edition, Tata McGraw Hill, 2006.
2. Kenneth. J. Ayala. The 8051 Microcontroller, 3rdedition, Cengage learning, 2010
3. Microcontrollers and application, Ajay. V. Deshmukh, TMGH. 2005
4. The 8051 Microcontrollers, Architecture and programming and Applications -K.Uma Rao, Andhe Pallavi Pearson, 2009.
5. Bamett,Cox&O'Cull, "Embedded C Programming and the MicrochipPlC" Thomson India Edition, 2007.
6. B.Peatman, "Design with PIC Microcontroller", Prentice hall, 1997

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **VLSI Design**	Course Code: **FA5020**
Credit: 3.5	L T P **3 1 0**
Year: **3rd**	Semester: **V**

UNIT 1: INTRODUCTION **8 L**

VLSI design methodologies, VLSI design flow, Design Hierarchy, Concepts of regularity, modularity and locality, VLSI design styles: full custom, semi-custom, FPGA, Gate array

MOS Transistor: MOS structure, MOS system under external bias, threshold voltage, V-I characteristics, derivation of drain current, channel length modulation, substrate bias effect

UNIT 2 : CMOS INVERTER **8 L**

Resistive load inverter, Enhancement/depletion load inverter (circuit diagram, advantages and disadvantages); Static CMOS inverter: Voltage transfer characteristics, calculation of VIL, VIH and VTH, noise margin concepts and their evaluation, power consumption.

UNIT 3 : LOGIC **10 L**

Combinational Logic: CMOS logic design, Stick diagram and layout design; CMOS transmission gate logic;

Sequential Logic: Timing metric for sequential circuits, Static latches and registers: bi-stability principle, MUX based latches, static SR flip-flops, master-slave edge-triggered register, Dynamic latches and registers: CMOS D-latch, Edge triggered flip flop, Dynamic Transmission-Gate Edge-triggered Registers, C2MOS

Dynamic logic Circuits: Pass transistor; ratioed logic; Dynamic CMOS logic; Domino logic; NORA CMOS logic

BiCMOS: Electrical characteristics, comparison with CMOS, design of basic gates

UNIT 4: MEMORY **10 L**

Memory classification, Non-volatile memory: design of NAND and NOR based ROM; DRAM: design (1T, 2T, 3T), read and write operations and operating modes; SRAM: design and operation; Flash Memory: design, data programming and erasing techniques; Peripheral circuitry: address decoder, sense amplifier, voltage references Memory reliability: Signal to noise ratio; memory yield

UNIT 5: DESIGN FOR TESTABILITY **6 L**

Fault types and models; controllability and observability; Design for testability: Ad Hoc testing; structured design for testability, Self test and Built-In self Test (BIST) Techniques.

Text Books:

1. CMOS Digital Integrated Circuits by Sung-Mo Kang, Tata McGraw Hill

Reference Books:

1. Principle of CMOS VLSI Design by Neil H.E. Weste, Pearson Education India
2. Digital Integrated Circuits by Jan M. Rabey, Prentice Hall Publication

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Automatic Control Systems**	Course Code: **FA5010**
Credit: 3.5	L T P **3 1 0**
Year: **3rd**	Semester: **VI**

UNIT 1 **8 L**

Open Loop And Closed Loop Control Systems: feedback characteristics of control systems, Mathematical Representation of physical systems Electrical, Mechanical, Hydraulic, Thermal systems, Block diagram algebra and signal flow graphs, Mason's gain formula.

UNIT 2 **8 L**

Time Domain Analysis: Standard Test Signals, Time response of First, Second and Higher order systems, Performance Indices.

Frequency Response Analysis: Correlation between time and frequency response, polar and inverse plots, Nyquist stability criterion, Bode plots. All pass and minimum phase systems, M and N circle

ERROR ANALYSIS: Static and Dynamic Error Coefficients, Effect of adding poles and zeroes to the system, response of P, PI, and PID controllers.

UNIT 3 **8 L**

Stability Of Control Systems: Concept of stability, Asymptotic and conditional stability, Routh-Hurwitz Criterion, Root Locus technique (Concept and construction), Stability analysis of first order LP,HP, Band Pass filters.

State Variable Analysis: Introduction, State space representation, State modes of linear systems, State equations, transfer matrices, diagonalization solution of state equations, controllability and observability, effect of pole zero cancellation in transfer function.

UNIT 4 **8 L**

Design through Compensation Techniques: Realization of lag, lead and lag-lead compensators, Design of closed loop control system using root locus and Bode plot Compensation, Robustness.

Artificial Intelligence: Introduction to Fuzzy logic controllers and ANN.

UNIT 5 **8 L**

Basic Non-Linear Analysis: Linearization, describing function and phase plane methods, stability concepts and Lyapunov functions.

Basics of Digital Control: sampled data control system, zero order hold and signal recovery, pulse transfer function and its realization.

Bilinear Transformation

Text Books:

1. I J Nagrath & M Gopal, Control System Engineering; New Age International publishers.
2. B C Kuo, Automatic Control Systems; John Wiley (India)
3. Norman S Nise, Control System Engineering; John Wiley & Sons, Singapore
4. D Ganesh Rao, Control System; Sanguine Technical Publisher, Bangalore
5. K Ogata, Modern Control Engineering; PHI.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Principles of Management**	Course Code: **HA5010**
Credit: 2	L T P **2 0 0**
Year: **3rd**	Semester: **V**

UNIT – I **5L**

Overview of management: Definition of management, need for management, role of managers, Management as science and art, evolution of management thought, contribution of Taylor and Fayol, Types of business organizations, Levels of management

UNIT – II **9L**

Planning: Definition of planning, steps involved in planning, types of planning, objectives, process of managing by objectives, Strategy, types of strategies, Policy, types of policies, Decision making, types of decision making process.

UNIT – III **10L**

Organizing: Nature, purpose and structure of organization, formal and informal organization, Departmentation, its importance, basis of departmentation, Line and staff authority, Centralization and decentralization, Authority and responsibility, delegation of authority
Selection and recruitment, orientation, appraisal, HRD.

UNIT – IV **8L**

Directing: Creativity and innovation, Motivation, hierarachy of needs, motivation theories, Leadership – definition, elements, styles, leadership theories
Organization culture, elements and types of culture, managing cultural diversity.

UNIT – V **8L**

Controlling: System and process of controlling, requirements of effective control, Types of control, cost control, purchase control, maintenance control, quality control, planning operations
Globalization and liberalization.

Reference Books:

1. Charles W. L. Hill and Steven McShane, “Principles of Management”, McGraw Hill Education, Special Indian edition, 2007.
2. R. N. Gupta, “Principles of Management “, S Chand Limited, 2007.
3. P. C. Tripathy and P. N. Reddy, " Principles and Practices of Management”, Tata McGraw Hill, 1999
4. Joseph L. Massie, “Essentials of Management” , Prentice Hall of India, 2003.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Digital Communication**	Course Code: **FA6210**
Credit: 4.5	L T P **3 1 2**
Year: **3rd**	Semester: **VI**

UNIT 1: Elements of Digital Communication and Information Theory: 8 L

Model of a Digital Communication, System, Probability Theory, Entropy and Information Rate, Conditional Entropy and Redundancy, Source Coding, Fixed and Variable Length Code Words, Source Coding Theorem, Prefix free code and, Kraft Inequality, Shannon-Fano and Huffman Coding.

UNIT 2: Digital Base Band Transmission 8 L

PCM Coding, DM, DPCM, ADCM, Data Transfer Rate, Line Coding and Its Properties, NRZ & RZ Types, Signalling Format For Unipolar, Polar, Bipolar(AMI) & Manchester Coding Matched Filter Receiver, Derivation of Its Impulse Response and Peak Pulse Signal to noise ratio, ISI, Rectangular, sync & Raised cosine pulse comparison

UNIT 3: Digital Modulation Techniques 8 L

Gram-Schmidt Orthogonalization Procedure, Hilbert transform, Types of Digital Modulation, correlation receiver, Waveforms for Amplitude, Frequency and Phase Shift Keying, Method of Generation and Detection of Coherent & Non-Coherent Binary ASK, FSK & PSK & PSD derivation for Coherent & Non- Coherent Binary ASK, FSK & PSK. Differential Phase Shift Keying, bit error rate comparison of Digital modulation techniques

UNIT 4: Advanced Modulation Techniques 8 L

Introduction to M-arymodulation techniques 16 PSK, QPSK, QAM, Continuous phase shift keying, MSK, GMSK. Direct sequence spread spectrum, processing gain Frequency hop Spread spectrum.

UNIT 5: Error Control Coding 8 L

Error Free Communication Over a Noise Channel, Hamming code, Relation Between Minimum Distance and Minimum Distance Error Correcting & detection Capability, Linear Block Codes, Encoding and Syndrome Decoding, Cyclic Codes, Encoder and Decoder For Cyclic Codes, Convolution Coding & Viterbi decoding, introduction to burst error correction codes

Text Books:

1. Haykin, Simon "Communication Systems" John Wiley, 5th Ed., 2010.
2. Singh, R .P. &Sapre, S .D. / "Communication Systems : Analog & Digital" / TMH .
3. Lathi, B .P / "Modern Digit al & Analog Communication Systems " / OUP.
4. Simon Haykin / "Digital Communication" / John Wiley.
5. Taub& Schilling / "Principles of Communication Systems " / Tata McGraw-H ill /
6. A.B .Carls on / "Communication Systems " / Tata McGraw-H ill.
7. Prokis J.J / "Digit al Communications " / McGraw Hill /
8. CharkrabartI.P. / "Analog Communication Systems " / Dhanpat Rai & Co.

Digital Communication Lab

1. To study sampling and reconstruction of the sampled signal
2. To study Delta Modulation and Adaptive Delta Modulation.
3 To study ASK, PSK,FSK, -modulation system.
4. To Study TDM/PCM Transmitter /Receiver.
5. To Study DHSS, FHSS.
6. To Study Error Control Coding using Simulink.
7. To Study different Line Coding Techniques.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Micro-Strip Antenna**	Course Code: **FA6220**
Credit: 4.5	L T P **3 1 2**
Year: **3rd**	Semester: **VI**

UNIT 1: Introduction **8 L**

Introduction to Planer Transmission Line, Discontinuities in Micro-strip line, half wave length, Introduction to Patch Antenna, Types of MSA, Basic Principle, Operation of Patch Antenna , Parameters and Fields of Microstrip Antennas, Fringing Fields, Transformation of rectangular to circular.

UNIT 2: Design Methodology **8 L**

Feeding And Impedance Matching Methods For Patch Antennas, Line calculation for MSA, Inset Feed, Fed with a Quarter-Wavelength Transmission Line, Coaxial Cable or Probe Feed, Coupled (Indirect) Feeds, Aperture Feeds, series & parallel fed, Corporate Feeds.

UNIT 3: Trade-Offs and Design Parameters of Microstrip Antennas **8 L**

Effect of variation in length, width and height, permittivity, Change of substrate, Effect on Antenna Bandwidth and slotting, "shrinking" of the patch antenna.

UNIT 4: Simulation of Transient Fields under a Microstrip Antenna **8 L**

Design of Microstrip Patch, transient pulse response, Simulation Methodology, S11 (return loss) , VSWR, Field Effect on Antenna, Analysis of Patch/Microstrip Antennas, Far and near field radiation Pattern.

UNIT 5: Planar Inverted-F Antennas (PIFAS) and Defective Ground Technique **8L**

half-Wavelength Patch, Shorting Pin at the Feed to a Patch Antenna, Planar Inverted F-Antenna (PIFA), Capacitive Loading in PIFA Antennas, PIFAS in the Real World, PIFA Analysis, Defective Ground Structure, parasitic structure and its analysis.

Text Books:

1. Microstrip Antennas: The Analysis and Design of Microstrip Antennas and Arrays, edited by David M. Pozar, Daniel H. Schaubert, IEEE Antennas and Wave Propagation, 2012.
2. Broadband Microstrip Antennas, ByGirish Kumar, K. P. Ray, Artech House Inc.,2003.

LABORATORY:

Tutorial on the tools used for characterizing antennas and a discussion on the use of the Numerical Electromagnetics Code (NEC)/HFSS/FEKO software. This software can be used for the analysis and design of antennas and can predict antenna input impedances, patterns, currents, etc… The lab instructor will give a brief lesson on the NEC/HFSS/FEKO software through an interactive example. Finally, each lab station will independently analyze an antenna design presented by the instructor.

Using the same groups as used for the microstrip lab, you will use the lab time and help from your instructor to pick an antenna design for construction. Constraints on the design you choose include:

- It must operate in the frequency range from 100MHz to 1 GHz.
- It must have an azimuthal pattern that has directivity. A simple vertical dipole will not suffice.
- The antenna should consist of a wired structure.

This is negotiable with the instructor but wire structures are more conducive for NEC/HFSS/FEKO analysis. Once you have picked a basic design, you will use the NEC/HFSS/FEKO code to optimize your design based on your physical parameters (wire gauge, feed structure,…). You will also need to design a matching network to obtain a VSWR of less than 1.5. When you are satisfied that you antenna will work based on simulation, you will proceed with construction.

Before your scheduled testing time, each group will construct their antenna. If you have difficulty finding parts, contact your instructor for help. The final construction of your antenna should be robust enough to allow it to be handled during testing. You may want to use PVC, wood, or plexiglass forms for physical support. The antenna should be light weight enough to allow it to be mounted to a mast and raised into the air. Use a BNC connector as the feedpoint connector for the antenna.

To characterize your antenna, you need to make the following measurements:

- Input impedance (independent)
- VSWR (independent and with instructor)
- Relative current distribution (independent)
- Azimuthal antenna pattern (with instructor)
- Front-back ratio if directional (with instructor)

You will then compare these measurements with your predicted results (from NEC/HFSS/FEKO) in your final report.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Data Communication Networks**	Course Code: **FA6010**
Credit: 3.5	L T P **3 1 0**
Year: **3rd**	Semester: **VI**

UNIT 1: INTRODUCTION **8 L**

INTRODUCTION: Switching systems, network hardware and software, Layering, design issues for layering, reference models and their comparison, example networks

PHYSICAL LAYER: Transmission media and channel impairments, modulation, multiplexing, digital channels, mobile telephone systems

UNIT 2: DATA LINK LAYER **8 L**

DATA LINK LAYER: Design issues, framing, error control, elementary data link protocols and sliding window protocols, HDLC, data link layer in internet.

MEDIUM ACCESS CONTROL: Channel allocation problem, MAC protocols- Aloha, CSMA, collision free protocols, limited contention protocol. Ethernet, IEEE 802.3 standard. Repeaters, bridges, routers and gateways.

UNIT 3: NETWORK LAYER **8 L**

NETWORK LAYER: Design issues, VC and datagram subnets, routing algorithms for wired and wireless hosts, congestion prevention policies, load shedding. Connectivity of networks, connectionless internetworking, internetwork routing, fragmentation. IP protocols, IP addressing, OSPF, IPv6.

UNIT 4: TRANSPORT LAYER **8 L**

TRANSPORT LAYER: Transport service and primitives, Addressing, connation establishment and release, flow control, buffering, multiplexing and crash recovery. Introduction of UDP. Modeling TCP connection management, TCP congestion control. Performance issues

UNIT 5: HIGHER LAYERS **8 L**

DNS name space and DNS server, overview of www, http. Introduction of cryptography, substitution cipher and transposition cipher, DES, cipher methods, public key algorithms. Social issues- privacy, freedom of speech, copy right

Text Books:

1. Forouzan, B.A., "Data Communication and Networking", 4th Ed., Tata McGraw-Hill.
2. Tanenbaum, A.S, "Computer Networks", 4th Ed., Pearson Education.
3. Stallings W., "Data and Computer Communication", 8th Ed., Prentice-Hall.
4. Kurose, J.F. and Ross, K.W., "Computer Networking: A Top-Down Approach Featuring the Internet", 3rd Ed., Addison Wesley.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Principles of Mobile Communications**	Course Code: **FA6020**
Credit: 3.5	L T P **3 1 0**
Year: **3rd**	Semester: **VI**

UNIT I: WIRELESS COMMUNICATION **8 L**

Cellular systems- Frequency Management and Channel Assignment- types of handoff and their characteristics, dropped call rates & their evaluation – MAC–SDMA –FDMA – TDMA – CDMA – Cellular Wireless Networks

UNIT II: WIRELESS NETWORKS **8 L**

Wireless LAN–IEEE 802.11 Standards– Architecture – Services – Mobile Ad-hoc Networks- WiFi and WiMAX - Wireless Local Loop

UNIT III: MOBILE COMMUNICATION SYSTEMS **8 L**

GSM-architecture-Location tracking and call setup – Mobility management – Handover- Security- GSM SMS–International roaming for GSM- call recording functions-subscriber and service data mgt– Mobile Number portability – VoIP service for Mobile Networks – GPRS –Architecture-GPRS procedures-attach and detach procedures-PDP context procedure-combined RA/LA update procedures-Billing

UNIT IV: MOBILE NETWORK AND TRANSPORT LAYERS **8 L**

Mobile IP–Dynamic Host Configuration Protocol-Mobile AdHoc Routing Protocols– Multicast routing-TCP over Wireless Networks –Indirect TCP –Snooping TCP–Mobile TCP–Fast Retransmit/ Fast Recovery– Transmission/Timeout Freezing-Selective Retransmission – Transaction Oriented TCP- TCP over 2.5 / 3G wireless Networks

UNIT V: APPLICATION LAYER **8 L**

WAP Model- Mobile Location based services -WAP Gateway –WAP protocols–WAP user agent profile-caching model- wireless bearers for WAP – WML– WML Scripts - WTA- iMode- SyncML.

Text Books:

1. Jochen Schiller, "Mobile Communications", 2nd Edition, Pearson Education, 2003.
2. William Stallings, "Wireless Communications and Networks", Pearson, 2002.

Reference Books:

1. KavehPahlavan, Prasanth, "Principles of Wireless Networks", First Edition, Pearson Education, 2003.
2. UweHansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, 2003.
3. C.K.Toh, "AdHoc Mobile Wireless Networks", First Edition, Pearson Education, 2002

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Power Electronics & Devices** (***Inter Departmental Elective–I***)		Course Code: **EA5210**
Credit: 3.5	L **3**	T **1**	P **0**
Year: **3rd**		Semester: **VI**

UNIT I

Power Semiconductor devices: Power semiconductor devices, their symbols and static characteristics, characteristics and specifications of switches, types of power electronic circuits, thyristor operation, V-I characteristics, two transistor model, method of turn on operation of GTO, MCT and TRIAC.

DC-DC Converter: Principle of step down chopper, step down chopper with R-L load, principle of step up chopper and operation with R-L load, classification of choppers.

UNIT II

Phase controlled converters: Single phase half wave controlled rectifier with resistive and inductive loads, effect of freewheeling diode, single phase fully controlled and half controlled bridge converters.

UNIT III

Fundamentals of Electric Drives: Electric drives and its parts, advantage of electric drives, classification of electric drives, speed-torque conventions and multi-quadrant operations, constant torque and constant power operation, types of load, load torque: components, nature and classification.

UNIT IV

Dynamics of motor load combination, steady state stability of electric drive, transient stability of electric drive,Selection of motor power rating: thermal model of motor for heating and cooling, classes of motor duty, determination of motor power rating for continuous duty, short time duty and intermittent duty, load equalization.

UNIT V

Power Electronic Control of DC & AC Drives: Rectifier control of dc series motor, chopper control of separately excited dc motor and dc series motor, special drives switched reluctance motor, brushless dc motor, servo control.

Recommended Books:

1. P.S.Bhimbhra, “Power Electronics”, Khanna Publication
2. Aggarwal. J.P., “Power Electronics”, Pearson Education
3. M.S. Jamil Asghar, “Power Electronics”, Prentice Hall of India Ltd., 2004
4. V. Subrahmanyam, “Electric Drives: concept and applications”, Tata McGraw Hill
5. Gopal k. Dubey, ‘Fundamentals of Electric Drives’, Narosa Publishers, New Delhi

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Artificial Neural Network & Fuzzy Logic** (***Inter Departmental Elective–I***)			Course Code: **EA7010**
Credit: 3.5	L	T	P
	3	**1**	**0**
Year: **3rd**			Semester: **VI**

UNIT-I

Neural Networks-1(Introduction & Architecture): Neuron, biological neuron, Artificial Neuron and its model, activation functions, Neural network architecture: Single layer and multilayer feed forward networks, recurrent networks, and various learning techniques.

Unit-II

Back propagation networks Architecture: perceptron model, single layer artificial neural networks, multilayer perceptron model; back propagation algorithm, effects of learning coefficient; factors affecting back propagation training, applications.

UNIT-III

Fuzzy logic-I (Introduction): Basic concept of fuzzy, Fuzzy sets and crisp sets, Fuzzy sets theory and operations, Properties of fuzzy sets. Fuzzy and crisp relation.

UNIT-IV

Fuzzy Membership Functions, Rules: Membership functions, inference in fuzzy logic, fuzzy if then rules, fuzzifications&defuzzifications, fuzzy controller.

UNIT-V

Application of Neural and fuzzy logic: Application of neural network, Neural Network approach in load flow study. Fuzzy logic application in industries.

Text Books:

1. S. Rajasekaran and G.A.V.Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI

Reference Books:

1. Simon Haykins, ”Neural Networks” Prentice Hall of India
2. Moore, “Digital control devices”, ISA press, 1986.
3. Kumar Satish, “Neural Networks”, Tata McGraw Hill
4. Timothy J Ross, “Fuzzy Logic with Engineering Applications”, McGraw Hill 1997

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Electrical Machines** (***Inter Departmental Elective–I***)			Course Code: **EA32L0**
Credit: 3.5	L	T	P
	3	**1**	**0**
Year: **3rd**			Semester: **VI**

UNIT I

Principle of Electro-mechanical Energy Conversion:- Introduction, Flow of Energy in Electromechanical Devices, Generated emf in machines, torque in machines with cylindrical air gap.

UNIT II

D.C. Machines: Construction of DC Machines, Emf and torque equation, armature reaction, commutation, performance characteristics of D.C. generators.

UNIT III

D.C. Machines (contd.):- Performance characteristics of D.C. motors, starting of D.C. motors, 3-point and 4-point starters

UNIT IV

Speed Control of D.C. Motors: Field control, armature control, and voltage control (semiconductor device control method)

UNIT V

Universal Motor, single phase a.c. series compensated motor, stepper motors (working& principal), gear motor, Principal of operation of 2-phase & 3-phase induction motor.

Recommended Books:

1. El Hawary, 'Principles of Electric Machines and Power Electronics', Wiley India
2. I.J. Nagrath & D.P. Kothari, "Electrical Machines", TMH
3. Charles Gross, "Electrical Machines", T&F Delhi
4. Srivastava, R.C., "Electric Machines", Cengage Learning
5. P. S. Bhibhra, 'Electrical Machines', Khanna Publishers

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Engineering Economics**	Course Code: **GC5010**
Credit: 2	L T P **2 0 0**
Year: **3rd**	Semester: **VI**

UNIT-I

Time value of money: Simple and compound interest, Time value equivalence, Compound interest factors, Cash flow diagrams, Calculation, Calculation of time –value equivalences. Present worth comparisons, Comparisons of assets with equal, unequal and infinite lives, comparison of deferred investments, Future worth comparison, payback period comparison.

UNIT-II

Use and situations for equivalent annual worth comparison, Comparison of assets of equal and unequal life. Rate of return, Internal rate of return, comparison of IIR with other methods, IRR misconceptions.

UNIT-III

Analysis of public Projects: Benefit/ Cost analysis, quantification of project, cost and benefits, benefit/ cost applications, Cost –effectiveness analysis.

UNIT-IV

Depreciation, computing depreciation charges, after tax economic comparison, Break-even analysis; linear and non-linear models. Product and Process Costing, Standard Costing, cost estimation, Relevant Cost for decision making, Cost control and Cost reduction techniques.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Optical Fiber Communication**	Course Code: **FA7210**
Credit: 4.5	L: **3** T: **1** P: **2**
Year: **4th**	Semester: **VII**

UNIT 1

INTRODUCTION: Demand of Information Age, Block Diagram of Optical fiber Communication System, Technology used in OFC System, Structure and types of Fiber, modes and Configuration, mode theory for circular guide modal equation, modes in optical fiber, linearly polarized modes, attenuation factors, pulse broadening in optical fiber, single mode fiber, mode field diameter, single distortion in single mode fiber, Derivation of material dispersion and waveguide dispersion. Attenuation, Signal Degradation in Optical Waveguides, Pulse Broadening in Graded index fiber Waveguides, Mode Coupling.

UNIT 2

OPTICAL SOURCES:

LED: Visible LED, Infrared LED, LED structure and configuration, Loss mechanism, Application of LED, operating Characteristics materials for Visible LED.

LASER: Principle of LASER Action, Efficiency of LASER Diode, principles and structures, index guided and gains guided lasers, mode separation, quantum well laser, laser modulation.

UNIT 3

OPTICAL DETECTORS:

Optical Absorption in semiconductors, Types of Photo Diodes, Principle of photo detection, working and structures of p-i-n and APD photo detectors, noises in photo detectors, SNR, detector response time effects, comparison of various photo detectors.

UNIT 4

ANALYSIS AND PERFORMANCE OF OPTICAL RECEIVER:

Receiver Sensitivity, Photodiode for optical receiver, Optical Receiver Design, recent receiver circuits, System configuration and power budget.

UNIT 5

OPTICAL NETWORKS:

WDM concepts and principles, passive components, SONET/SDH networks, performance of WDM.

Suggested Books:

1. Optical Fiber Communications – Gerd Keiser, McGraw-Hill International edition, 3rdEdition, 2000.
2. Optical Communication- R. K. Singh, KatsonBooks, 2004.
3. Optical Fiber Communications – John M. Senior, PHI, 2ndEdition, 2002.
4. Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rdEd, 2004.
5. Text Book on Optical Fibre Communication & its Applications – S.C.Gupta, PHI, 2005.
6. Fiber Optic Communications – D.K. Mynbaev, S.C. Gupta & Lowell L. Scheiner, Pearson Education, 2005
7. Fiber Optic Communications – Joseph C. Palais, 4th Edition, Pearson Education, 2004

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Wireless Communication**	Course Code: **FA7010**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VII**

UNIT 1

Services and Technical Challenges: Types of Services, Requirements for the services, Multipath propagation, Spectrum Limitations, Noise and Interference limited systems, Principles of Cellular networks, Multiple Access Schemes.

UNIT 2

Wireless Propagation Channels : Propagation Mechanisms (Qualitative treatment), Propagation effects with mobile radio, Channel Classification, Link calculations, Narrowband and Wideband models, propagation models, Path loss components.

UNIT 3

Wireless Transceivers: Structure of a wireless communication link, Modulation and demodulation – Quadrature/4-Differential Quadrature Phase Shift Keying, Offset-Quadrature Phase Shift Keying, Phase Shift Keying, Binary Frequency Shift Keying, Minimum Shift Keying, Gaussian Minimum Shift Keying, Power spectrum and Error performance in fading channels.

UNIT 4

Signal Processing in Wireless Systems: Principle of Diversity, Macro-diversity, Micro-diversity, Signal Combining Techniques, Transmit diversity, Equalizers- Linear and Decision Feedback equalizers, Review of Channel coding and Speech coding techniques.

UNIT 5

Advanced Transceiver Schemes: Spread Spectrum Systems- Cellular Code Division Multiple Access Systems- Principle, Power control, Effects of multipath propagation on Code Division Multiple Access, application of Orthogonal Frequency Division Multiplexing in GSM, IS–95, IS-2000 and Third Generation Wireless Networks and Standards

SUGGESTED BOOKS:

1. Andreas.F. Molisch, "Wireless Communications", John Wiley – India, 2006.
2. Simon Haykin& Michael Moher, "Modern Wireless Communications", Pearson Education, 2007.
3. Rappaport. T.S., "Wireless communications", Pearson Education, 2003.
4. Gordon L. Stuber, "Principles of Mobile Communication", Springer International Ltd., 2001.
5. Andrea Goldsmith, Wireless Communications, Cambridge University Press, 2007.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Design of Communication System**	Course Code: **FA7020**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VII**

UNIT 1:

Network Noise and Inter-Modulation Distortion

Introduction to Radio Communication Systems, Noise sources, noise measures, design of low noise networks, inter-modulation distortions. Frequency selective networks and transformers: Series resonant circuits, parallel resonant circuits with transformers, impedance matching and harmonic filtering using reactive networks.

UNIT 2:

Audio Circuits

General features of audio amplifiers, LM380 audio power amplifier, phono-amplifier, circuits for tone control, audio mixers, graphic equalizers. Wideband amplifiers: Review of high frequency analysis of BJT and FET amplifiers, input compensation, neutralization and feedback techniques for wide banding cascade amplifiers, high frequency amplifiers using MOSFETS.

UNIT 3:

Phase Locked Loop Circuits

Basic PLL operation, transient response of PLL, Linear model of the PLL- 1st order, 2nd order PLL, lock range and capture range, phase detectors, PLL application- tracking filters, angle modulation, frequency demodulation, amplitude demodulation, phase shifters, signal synchronizers, frequency translators PLL IC 565, digital PLL.

UNIT 4:

Frequency Synthesizers

Direct frequency synthesis, frequency synthesis by phase lock, 565 as frequency synthesizer, effect of reference frequency on loop performance variable modulus dividers, down conversion, methods for reducing switching time, multiple loop frequency synthesizer, fractional N loops, direct digital synthesis, synthesizer design.

UNIT 5:

Mixers, Modulators and Demodulator Circuits

Frequency mixers, switching type mixers, diode ring mixers, square law mixers, BJT and FET mixers, review of balanced modulator principle, applications of balanced modulator, modulator/demodulator IC MC 1596, MC 1596 as balanced modulators, amplitude modulators, product detector, mixer, frequency doubler, AM generation and synchronous AM detection using XR-2208.

Text Books:

1. Modern Communication Circuits-Jack Smith, Mc-Graw Hill publication .

References Books:

1. Stensby, J. L., Phase Locked Loops, CRC Press LLC, Boca Raton, FL, 1997.
2. Bowick, C., RF Circuit Design, Newnes Publishing, Burlington, MA, 1982.
3. McClaning, K. and Vito, T., Radio Receiver Design, Noble Publishing Corp., Atlanta, GA, 2000.
4. Tomasi, W., Advanced Electronic Communications Systems, Fifth Edition, Prentice-Hall Inc., Englewood Cliffs, NJ, 2001.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Digital System Design Using Verilog** (***UG Elective–I***)	Course Code: **FA7610**
Credit: 4	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VII**

UNIT 1:
Introduction to Verilog:
ASIC design flow, Introduction to verilog, design methodologies; Language construct and lexical conventions, data types, system task and compiler directives, modules and ports, Gate level modeling

UNIT 2:
Data Flow Modeling:
Modelling at data flow level, Continuous Assignment Structures, Delays and Continuous Assignments, Assignment to Vectors, Operators, Verilog for combinational Circuits, Design of Adder, Subtractor, Decoders, Encoders, Multiplexer, code Converter.

UNIT 3:
Behavioral Modeling:
Behavioral modelling: Structured procedures, procedural assignments, Assignments with Delays, Conditional statements, case, casex and casez statements, Loops: while, for, repeat, forever, sequential and parallel blocks, force-release construct, assign-deassign construct, force and release, Design of Flip flop, Shift register and Counters using Verilog

UNIT 4:
Advance Verilog Topics:
Functions, Tasks, Timing and delays: delay models, path delay modelling, timing checks, user defined primitives, switch level modelling

UNIT 5:
State Machine and Programmable Logic Devices:
State Machine: Moore and mealy state model, Verilog code for moore-type FSM, Specification of Mealy FSM using Verilog, Mealy-type and Moore-type FSM for Serial Adder and verilog code, Programmable logic device: Introduction, Block diagram, macrocell structures and characteristics of PLDs and CPLDs. Architecture and features of FPGAs, FPGA design flow

TextBooks:
1. Verilog HDL by Samir Palnitkar, Sunsoft Press

Reference Books:
1. Fundamental of Digital Logic with Verilog Design; S. Brown & Z. Vransesic, TMH
2. Design through Verilog HDL; T.R. Padmanabhan & B. Bala Tripura Sundari, Wiley Pub. 2007
3. Digital System Design with FPGA and CPLD; Ian Grout, Newnes

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Coding for Reliable Communication** (***UG Elective–I***)			Course Code: **FA7620**
Credit: 4	L	T	P
	3	**1**	**0**
Year: **4th**			Semester: **VII**

UNIT 1:
Information and Channels Capacity
Measure of information – information content of message – average information content of symbol m log independent sequence – Markov statistical model for information source – Entropy and information rate Markov channel capacity theorem some properties.

UNIT 2:
Source Encoding
Shannon's first fundamental theory – Noiseless coding – source with finite memory Shannon's second fundamental theorem on coding for memory less noise channels Shannon's encoding algorithm.

UNIT 3:
Discrete Communication Channel's
Discrete communication channel's – rate of information transmission over a discrete channels – capacity of discrete memory less channel – discrete channel with memory– discrete channel with continuous noise – discrete channel with discrete noise.

UNIT 4:
Continuous Communication Channels
Continuous channels – Shannon – Harthley Theorem implication – continuous channels with continuous noise – Efficiencies of different communication system.

UNIT 5:
Error Correcting Codes
Galois field, Vector spaces and Matrices – block codes, binary cycle code – multiples Error correcting codes – Majority logic coding – Burst error correcting code – Tow dimensional Codes – ARQ – performance of codes.

Text Books:
1. J. Das, S. K. Mulick, P. K. Chatterjee, Principles of Digital Communication, Wiley Estate limited 1986.

Reference Books:
1. K. Sam Shanmugham 'Digital and Analog Communication System', John Wiely& Sons 1985
2. A. J. Viterbi and J.H.K. Omura, Principle of digital communication and coding. McGraw hill

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Industrial Electronics** **(*UG Elective–I*)**			Course Code: **FA7630**
Credit: 4	L	T	P
	3	**1**	**0**
Year: **4th**			Semester: **VII**

UNIT 1:
Regulated Supplies and SCR: Switched Mode voltage regulator, Comparison of Linear and Switched Mode Voltage Regulators, Servo Voltage Stabilizer, monolithic voltage regulators Fixed and Adjustable IC Voltage regulators, 3-terminal Voltage regulators, Current boosting .Principles of operation and characteristics of SCR, Triggering of Thyristors, Commutation Techniques of Thyristors, Classes A, B, C, D, E and F, Ratings of SCR.

UNIT 2:
Applications of SCR-I: Static circuit breaker, Protection of SCR, Inverters, Classification, Single Phase inverters, Converters , single phase Half wave and Full wave. Chopper circuits, Principle, methods and Configurations, Diac and Triac, Triggering modes, Firing Circuits, Commutation

UNIT 3:
Applications of SCR-II: Voltage compensator – solid state DC voltage regulation – DC shunt motor – armature control and field control of motor speed – electronic control of DC motor – speed regulator action – full wave motor speed regulation by one SCR.

UNIT 4:
Industrial Timers: Industrial timers -Classification, types, Electronic Timers, Classification, RC and Digital timers, Time base Generators. Electric Welding, Classification, types and methods of Resistance and ARC wielding

UNIT 5:
Industrial Heating Applications: High Frequency heating, principle, merits, applications, High frequency Source for Induction heating. Dielectric Heating, principle, material properties, Electrodes and their Coupling to RF generator, Thermal losses and Applications. Ultrasonics, Generation and Applications.

Text Books:
1. Industrial and Power Electronics, G.K. Mithal and Maneesha Gupta, Khanna Publishers, 19th Ed., 2003.

Reference Books:
1. Thyristors and applications, M. Rammurthy, East-West Press, 1977.
2. Industrial electronics and control, S.K. Bhattacharya and S.Chatterjee, Tata McGraw Hill, 1995
3. Frank D. Petruzella, Industrial Electronics, McGraw Hill International Editions, 1996

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Low Power VLSI Design** (*UG Elective-2*)	Course Code: **FA8610**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VIII**

UNIT 1:
Introduction:
Need for low power VLSI chips, Sources of power dissipation on Digital Integrated circuits. Emerging Low power approaches. Physics of power dissipation in CMOS devices, Power dissipation in CMOS, low power VLSI design limits.

UNIT 2:
Simulation Power Analysis:
SPICE circuit simulators, gate level logic simulation, capacitive power estimation, static state power, gate level capacitance estimation, architecture level analysis, Monte Carlo simulation. Probabilistic power analysis: Random logic signals, probability & frequency, probabilistic power analysis techniques, signal entropy.

UNIT 3:
Low Power Techniques:
Circuit level: Power consumption in circuits. Flip Flops & Latches design, high capacitance nodes, low power digital cells library Logic level: Gate reorganization, signal gating, logic encoding, state machine encoding, pre-computation logic.

UNIT 4:
Low Power Architecture & Systems:
Power & performance management, switching activity reduction, parallel architecture with voltage reduction, flow graph transformation, low power arithmetic components, low power memory design.

UNIT 5:
Low Power Clock Distribution:
Power dissipation in clock distribution, single driver Vs distributed buffers, Zero skew Vs tolerable skew, chip & package co design of clock network. Algorithm & architectural level methodologies: Introduction, design flow, Algorithmic level analysis & optimization, Architectural level estimation & synthesis.

Text Books:
1.Gary K. Yeap, "Practical Low Power Digital VLSI Design", KAP, 2002
2.Rabaey, Pedram, "Low power design methodologies" Kluwer Academic, 1997

Reference Books:
1.Kaushik Roy, Sharat Prasad, "Low-Power CMOS VLSI Circuit Design" Wiley, 2000

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Selected Topics in Communication** (*UG Elective-2*)	Course Code: **FA8620**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VIII**

UNIT 1
Software defined radio; Cognitive radio: Definition, spectrum management, computational intelligence, architecture and radio resource management.

UNIT 2
Review of third generation cellular systems and standards, multicarrier modulation and multiple access techniques; Broadband wireless access, OFDMA and mobile WiMAX.

UNIT 3
Space-time wireless communications, linear diversity techniques, space-time coding; MIMO detection and channel estimation, iterative detection and decoding, MIMO-OFDM; Smart antennas; Ultra wideband communication.

UNIT 4
Advanced physical and MAC layer alternatives for wireless PAN, LAN, MAN and cellular networks; Mobile ad hoc and wireless sensor networks, adaptive link, MAC and network layer, energy efficiency and cross-layer design.

UNIT 5
Wireless capacity and channel state estimation, network capacity, information theory and network architecture, capacity of ad hoc networks; Wireline and wireless cooperation strategies, multi-antenna relaying, cooperative diversity, cooperative physical layer architecture.

Suggested Books:

1. Fette, B., "Cognitive Radio Technology", Elsevier. 2006
2. Mitola III, J., "Cognitive Radio Architecture: The Engineering Foundation of Radio XML", Wiley-Interscience. 2006
3. Giannakis, G.B., Hua, Y., Stoica, P. and Tong, L., "Signal Processing Advances in Wireless and Mobile Communications", Vol.1 and Vol. 2, Prentice- Hall. 2001
4. Pietrzyk, S., "OFDMA for Broadband Wireless Access", Artech House. 2006
5. Siwiak, K. and McKeown, D., "Ultra-wideband Radio", John Wiley & Sons. 2004
6. Paulraj, A., Nabar, R. and Gore, G., "Introduction to Space-Time Wireless Communications", Cambridge University Press. 2003
7. Gilsic, S.G., "Advanced Wireless Networks: 4G Technology", John Wiley & Sons. 2006

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Optimal Control** (*UG Elective-2*)	Course Code: **FA8630**
Credit: 3.5	L T P **3 1 0**
Year: **4th**	Semester: **VIII**

UNIT 1

Process Characteristics: Terms and Objectives, Incentives for process Control – design aspects of a Process Control System- Classification of variables.

Process Equation, Process variables, Degrees of freedom. Characteristics of liquid system, gas system, thermal system. Mathematical modelling of processes. Self regulating-Servo and Regulatory, Interacting and Non-Interacting process – Inverse response.

UNIT 2

Process Control Elements: Signal conversion - I/P, P/I Converters, Pneumatic and Electric actuators, Valve Positioner-Control Valve – Characteristics of Control Valves-Types of control valves- Control valve sizing-cavitation and flashing. Dynamics of batch and Continuous process.

UNIT 3

Controller: Basic control actions – Discontinuous control mode, Continuous control mode- Proportional, Single speed floating, Integral and Derivative– Composite control modes – P+I, P+D and P+I+D control modes. Response of controller for different types of test inputs – Integral windup – Auto manual transfer. Selection of control mode for different processes – Typical control schemes for level flow, pressure and temperature.

Controller Tuning: Zeigler and Nichols open and Closed loop methods, Performance indices –Based on evaluation criteria – ISE, IAE, ITAE.

UNIT 4

Introduction to Optimal Control: Statement of optimal control problem – Problem formulation and forms of optimal control – Performance measures for optimal control – Selection of performance measure – Various methods of optimization – Linear programming – Nonlinear programming – Dynamic programming.

UNIT 5

Dynamic Programming: Principle of optimality – Recurrent relation of dynamic programming for optimal control problem – Computational procedure for solving optimal control problems – Characteristics of dynamic programming solution – Hamilton Jacobi Bellman equation – Application to a continuous linear regulator problem.

Text Books:

1. C.Stephanopoulos, "Chemical process control", Prentice Hall of India. 1998.
2. Singh, 'Process Control" PHI Learning, 2009
3. B. Sarkar, 'Control System Design – The Optimal Approach', Wheeler Publishing, New Delhi, 1997.
4. M. Gopal, 'Modern Control System Theory', New Age International Ltd., 2002.

Reference Books:

1. D.P. Eckman, "Automatic Process Control", Wiley Eastern Ltd., 1972.
2. D.R. Coughanowr, "Process System Analysis and Control", Second Edition, McGraw Hill 1991.
3. K. Ogata, "Modern Control Engineering", Prentice Hall of India, 1982.
4. Donald E. Kirk, 'Optimal Control Theory – An introduction ', Pearson Education, 1970.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **PLC, SCADA and Distributed Control System** **(*UG Elective–3*)**		Course Code: **FA86A0**
Credit: 3.5	L **3**	T **1**	P **0**
Year: **4th**		Semester: **VIII**

UNIT 1
PLC & SCADA Fundamentals – Discrete state Vs continuous state control-Evolution of modern day, PLCs building blocks of PLCs-Communication in PLCs.

UNIT 2
PLC & SCADA Applications-Programming methods- Relay & logic ladder diagrams-Boolean logic-High level languages-Graphical representation- programming examples – Comparative study of industrial PLCs.

UNIT 3
Elements of DCS –Evolution of DCS - Building blocks- Detailed descriptions and functions of field control units-Operator stations and data highways-Redundancy concepts.

UNIT 4
Case studies in DCS-Comparative study of industrial DCS-Reliability calculations -intrinsically safe instrumentation –Case studies

UNIT 5
Communications in DCS - Basics of Computer networks - Special requirements of network used for control - Communication protocols-link access mechanism- Manufactures automation protocols - Field bus and Smart transmitters.

Text Books:
1. Lukcas M.P., Distributed control systems, Van Nostrand Reinhold co., Newyork,1986.
2. Huges T, Programmable Logic Controllers, ISA Press,1994.

Reference Books:
1. Moore, Digital control devices, ISA press, 1986.
2. Tanaenbaum A.S., Computer networks, Prentice Hall, 1998.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Radar and Navigation (*UG Elective–3*)**			Course Code: **FA86B0**
Credit: 3.5	L	T	P
	3	**1**	**0**
Year: **4th**			Semester: **VIII**

UNIT 1

Radar Signal Models: Amplitude models, distributed target forms of range equation, radar cross section, statistical description of radar cross section, Swerling model, Clutter, signal to clutter ratio, temporal and spatial correlation of clutter, noise model and signal to noise ratio, frequency models, Doppler shift, simplifies approach to Doppler shift, stop and hop assumption, spatial model, variation with angle, variation with range, projections, multipath, spectral models.

UNIT 2

Radar Wave Forms: Waveform matched filter of moving targets, ambiguity function, ambiguity function of the simple matched pulse filter for the pulse burst, pulse by pulse processing, range ambiguity, Doppler response and ambiguity function of the pulse burst. Introduction to Synthetic Aperture Radar (SAR)

UNIT 3

Detection Fundamentals: Radar detection as hypothesis testing, Neyman-Pearson detection rule, likelihood ratio test, threshold detection of radar signals, non-coherent integration of non fluctuating targets, Albersheim and Shnidaman equations, Binary integration

UNIT 4

Radio Direction Finding: loop direction finder, goniometer, errors in direction finding, RADIO RANGES: LF/MF four course radio ranges, VOR, ground equipment & receiver, VOR errors.
Hyberbolic System of Navigation: LORAN & Decca DME & TECAN

UNIT 5

Aids to Approach and Landing: ILS & GCA & MLS DOPPLER NAVIGATION: Doppler frequency, Doppler radar equipment, CW & FMCW Doppler radar, frequency trackers, Doppler range equation.
Satellite Navigation System: Transit system, NAVSTAR, GPS, basic principles of operation, signal structure of NAVSTAR broadcasts, data message, velocity determination, accuracy of GPS & differential navigation, NAVSTAR receiver.

Suggested Books:

1. Fundamentals of radar signal processing, Mark A Richards, TMH.
2. Elements of Electronics Navigation, N. S. Nagraja, TMH.
3. Radar principles, Peebles Jr. P. Z., Wiley, NY.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Digital System Design using VHDL (*UG Elective–3*)**	Course Code: **FA86C0**	
Credit: 3.5	L	T	P
	3	**1**	**0**
Year: **4th**	Semester: **VIII**	

UNIT 1 **8 L**

Introduction to Hardware Design: Digital System Design Process, Hardware Description Languages, Hardware Simulation, Hardware Synthesis, Levels of Abstraction Basic Terminology: Entity declaration, architecture body, configuration declaration, package declaration and package body Basic Language elements: identifiers, data object, Data types: subtype, scalar, composite and access types, operators, overloading,

UNIT 2 **10 L**

Behavioral Modeling: Entity declaration, architecture body, process statement, variable assignment, signal assignment. Wait, If, Case, Null, Loop, Exit, Next and Assertion statements. Inertial and transport delays, Simulation deltas, Signal drivers. Data flow and Structural modelling: Concurrent signal assignment, sequential signal assignment, Multiple drivers, conditional signal assignment, selected signal assignment, block statements, concurrent assertion statement, component declaration, component instantiation

UNIT 3 **8 L**

Generics and Configurations: Generics, Why configurations, default configurations, component configurations. Generics in configuration. Generic value specification in architecture, block configurations, architecture configurations. Subprograms and Packages: Subprograms – functions, procedures, declarations. Package declarations, package body, Generate Statements, Type conversions, User defined attributes, Predefined attributes

UNIT 4 **10L**

Design of Networks for Arithmetic Operations: Design of serial adder with accumulator, state graph for control networks design of binary multiplier, multiplication of signed binary numbers, design of binary divider. Digital Design with SM Chart: state machine charts, derivation of SM charts, realization of SM charts, implementation of dice game

UNIT 5 **6 L**

VHDL Synthesis: Simple gate- concurrent statement, if control flow statement, case control flow statement, simple sequential statements, asynchronous reset, asynchronous preset clear, four bit shifter.

Text books:

1. A VHDL Primer, by J. Bhasker, PH/Pearson, 1999
2. Digital System Design using VHDL by Charles H Roth Jr, Thomson Learning, 02.

Reference books:

1. VHDL: Programming by Example by Douglas Perry, McGraw Hill
2. A VHDL Synthesis Primer, Second Edition, by J. Bhasker, Star Galaxy, 1998

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Satellite Communication** (*UG Elective–3*)			Course Code: **FA86D0**
Credit: 3.5	L	T	P
	3	**1**	**0**
Year: **4th**			Semester: **VIII**

UNIT 1 OVERVIEW OF SATELLITE SYSTEMS, ORBITS AND LAUNCHING METHODS: Frequency Allocations, Intelsat, U.S.Domsats, Polar Orbiting Satellites, Problems, Kepler's Law, Definitions of Terms for Earth-orbiting Satellites, Orbital Elements, Effects of a Nonspherical Earth, Atmospheric Drag, Inclined Orbits, Calendars, Universal, Sidereal Time,
Julian Dates, The Orbital Plane —The Geocentric-, Topcentric-Horizon, The Sub-satellite Point—Predicting Satellite Position.

UNIT 2 GEOSTATIONARY ORBIT & SPACE SEGMENT: Antenna Look Angels, The Polar Mount Antenna, Limits of Visibility, Near Geostationary Orbits, Earth Eclipse of Satellite, Launching Orbits, Problems, Power Supply, Attitude Control, Spinning Satellite Stabilization Momentum Wheel Stabilization, Station Keeping, Thermal Control, Transponders, Wideband Receiver,, Power Amplifier, Antenna Subsystem, Morelos, Advanced Spacecraft.

UNIT3 EARTH SEGMENT & SPACE LINK: Equivalent Isotropic Radiated Power, Transmission Losses, Free-Space Transmission, Feeder Losses, Antenna Misalignment Losses, Fixed Atmospheric and Ionospheric Losses, Link Power Budget Equation, System Noise, Antenna Noise, Amplifier Noise Temperature, Amplifiers in Cascade , Noise Factor, Noise Temperature, Overall System Noise Temperature, Carrier-to-Noise Ratio, Uplink, Saturation Flux Density, The Earth Station HPA, Downlink, Output Back off, Effects of Rain, Uplink rain-fade margin, fade margin, Combined Uplink and Downlink C/N Ratio, lntermodulation Noise.

UNIT4 SATELLITE ACCESS: Single Access — Preassigned FDMA, Demand-Assigned FDMA, SPADE System. Bandwidth-limited a Power-limited TWT amplifier operation, FDMA downlink analysis. TDMA: Reference Burst; Traffic Date, Frame Efficiency and Channel capacity, preassigned TDMA, Demand assigned TDMA, Speech Interpolation and Prediction, Downlink analysis for Digital transmission. Companion of uplink Power requirements for FDMA & TDMA.

UNIT5 DIRECT BROADCAST SATELLITE SERVICES: Introduction—Orbital Spacings—Power Rating and Number of Transponders—Frequencies and Polarization—Transponder Capacity—Home Receiver Outdoor Unit (ODU)—Home Receiver Indoor Unit (IDU)—Downlink Analysis—Uplink-Problems-Satellite Mobile Services—VSATs—Radarsat—Global Positioning Satellite System—Orbcomm.

SUGGESTED BOOKS:

1. Dennis Roddy,Satellite Communications, McGraw-Hill Publication Third edition 2001
2. Timothy Pratt — Charles Bostian & Jeremy Ailmuti, Satellite Communications, John Willy & Sons
3. Wilbur L. Pritchars Henri G.Suyder Hond Robert A.Nelson, Satellite Communication Systems Engineering, Pearson Education Ltd., Second edition 2003.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **CDMA, GSM Systems (*UG Elective–4*)**	Course Code: **FA86H0**
Credit: 4	L T P **3 1 0**
Year: **4th**	Semester: **VIII**

UNIT 1 **(12L)**

Cellular concept- frequency reuse, channel assignment, hand off, interference, trunking and grade of service, cell splitting, sectoring, microcell concept.

UNIT 2 **(12L)**

Introduction to radio wave propagation-free space propagation model, round reflection (2-ray) model, impulse response model of a multipath channel, parameters o mobile multipath channels, type of small scale fading, fading effect due to multipath time delay spread and Doppler spread, diversity technique for mobile wireless radio system.

UNIT 3 **(12L)**

Multiple access technique for wireless communication-FDMA, TDMA, spread spectrum multiple access-FHMA, CDMA, hybrid spread spectrum technique-space division multiple access- packet radio.

UNIT 4 **(12L)**

GSM-GSM network architecture, GSM channel type, frame structure for GSM,(signal processing in GSM-speech coding, channel coding, interleaving, ciphering, burst formatting, modulation, frequency hopping, demodulation) authentication and security in GSM, GSM call procedures, GSM hand off procedures.

UNIT 5 **(12L)**

CDMA digital cellular standards- Introduction, frequency and channel specification, forward and reverse CDMA channel, CDMA call processing, soft hand off, performance of a CDMA system, comparison of CDMA with GSM, digital cellular standards- DECT, PDC, PHS

Reference Books:

1. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press, 2005.
2. Simon Haykin & Michael Moher, “Modern Wireless Communications”, Person Education, 2007.
3. T. S. Rappaport, “Wireless Communication, Principles & Practice”, Dorling Kindersley India Pvt. Ltd., 2009.
4. G. L. Stuber, “Principles of Mobile Communications” , 2nd Edition, Springer Verlag. 2007.
5. Kamilo Feher, 'Wireless Digital Communication', Dorling Kindersley (India) Pvt. Ltd., 2006.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Digital Image Processing** (***UG Elective–4***)			Course Code: **FA86I0**
Credit: 4	L	T	P
	3	**1**	**0**
Year: **4th**			Semester: **VIII**

UNIT 1
Introduction: Fundamental steps in DIP, elements of DIP, Simple image model, Sampling & quantization, basic relationships between Pixels, Color image model.

UNIT 2
Image Transforms: One-dimensional & Two-dimensional DFT, Cosine, Sine, Hadamard, Haar, and Slant & KL transforms.
Image Enhancement: Introduction, Point operations, Histogram modeling, spatial operations, Transform operations

UNIT 3
Image Restoration: Introduction, Image observation models, Inverse & Wiener filtering, difference between enhancement & restoration Restoration-spatial filtering, Noise reduction in frequency domain.

UNIT 4
Image Compression: Introduction, Pixel coding, Predictive coding, Transform coding, Inter-frame coding.

UNIT 5
Image Segmentation: Introduction, Spatial feature extraction, Transforms features, Edge detection, Boundary extraction, Segmentation techniques.

Minor Project: submission of 15 pages of MATLAB Program on above.

Suggested Books:
1.Digital Image Processing, Rafael C. Conzalez Richard E Woods, 2nd Ed.TMH
2.Pratt "Digital Image Processing" 4th Edition, John Wiley(India)
3.Fundamentals of Digital Image Processing, Anil K Jain.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Optical Networks** (***UG Elective–4***)			Course Code: **FA86J0**
Credit: 4	L	T	P
	3	**1**	**0**
Year: **4th**			Semester: **VIII**

UNIT 1

Introduction: Introduction to Optical Networks Characteristics of Optical Fiber (Emphasis on Non Linear Characteristics), Timing & Synchronization.

UNIT 2

Components: Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers, Tunable Lasers, Switches, Wavelength Converters

UNIT 3

Networks: SONET/SDH- Multiplexing, SONET/ SDH Layers, Frame Structure, Frame Structure, Physical Layer, Elements of a SONET/SDH Infrastructure. ATM - Functions of ATM, Adaptation Layers, Quality of Service, Flow Control, Signaling and Routing. WDM Network Elements, Optical Line Terminals, Optical Line Amplifiers, Optical Add/ Drop Multiplexers, Optical Cross Connects.

UNIT 4

WDM Network Design: Cost Trade-offs, Light path Topology Design, and Routing and wavelength assignment problems, Dimensioning Wavelength Routing Networks, Network Survivability Basic Concepts, Protection in SONET/SDH, Protection in IP networks, Optical Layer Protection, Different Schemes, Interworking between Layers Access Networks, Network Architecture Overview, Enhanced HFC, FTTC.

UNIT 5

Optical Switching: OTDM, Synchronization, Header Processing, Buffering, Burst Switching. Deployment Considerations

Suggested Books:

1.Ramaswami, Rajiv &Sivarajan, Kumar N. / "Optical Networks a Practical perspective"/ Morgan Kaufmann Publishers / 2nd Ed.

2.Black, Uyless / "Optical Networks Third Generation Transport Systems"/ Pearson Educations

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Analog VLSI Design** (*UG Elective–4*)		Course Code: **FA86K0**
Credit: 4	L **3**	T **1**	P **0**
Year: **4th**		Semester: **VIII**

Unit 1 (8 L)

MOSFET: Device Structure, Threshold Voltage, C-V characteristics, I-V characteristics, device models, NMOS vs PMOS devices, long channel vs short channel devices.

Unit 2 (8 L)

Single stage Amplifiers: Common source, degenerate common source, source follower, common gate, cascode and folded cascode amplifiers.

Differential amplifier: Analysis, common mode response, Gilbert cell.

Unit 3 (8 L)

Current Mirrors: Basic current mirror, cascode current mirror, active current mirror.

Operational amplifiers: one stage and two stage op-amps, common mode feedback, input range limitation, slew rate, power supply rejection.

Unit 4 (10L)

Feedback in amplifiers: feedback topologies, effect of loading.

Band Gap References: Supply independent and temperature independent biasing, CTAT and PTAT voltage references, band gap gap voltage reference.

Unit 5 (8L)

Comparators: Types of comparators, open loop, regenerative and charge balancing comparators, two stage comparator.

Noise: noise sources, noise modeling of amplifier circuits.

Text books:

1. Razavi B., "Design of Analog CMOS Integrated Circuits", McGraw – Hill (2001)
2. Allen and Hollberg,"Analog CMOS Circuit Design", Oxford University Press (2016)

Reference Books:

1. Paul and Gray,"Analysis and Design of Analog Integrated Circuits", Fifth edition, John - Willey (2009)
2. Gregorian and G C Temes, Analog MOS Integrated Circuits for Signal Processing, John Wiley, 1986.
3. R L Geiger, P E Allen and N R Strader, VLSI Design Techniques for Analog& Digital Circuits McGraw Hill, 1990.
4. Gray and Meyer," Analysis and Design of AnalogIC ", Wiley international,1996.

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Embedded System** **(*UG Elective–4*)**		Course Code: **FA86L0**
Credit: 4	L **3**	T **1**	P **0**
Year: **4th**		Semester: **VIII**

UNIT 1: **6 L**

Introduction

Embedded System Overview, Design Challenges, Processor Technology, Design Technology, Embedded design life cycle, hardware and software partitioning and co-design,

UNIT 2: **10 L**

Processor Architectures: Harvard V/S Princeton , CISC V/S RISC; microcontrollers memory types; microcontrollers features : clocking, i/o pins, interrupts, timers, peripherals. Software development tools: embedded program development, compiler, cross compiler, linker, assembler, cross assembler, simulator. Out of circuit programming, In system programming, Emulator, In-circuit emulator

UNIT 3: **10L**

Microcontrollers:

Role of processor selection in Embedded System (microprocessor vs microcontroller), 8051 microcontroller: architecture, Embedded C programming, instruction set, addressing mode, logical operation, arithmetic operation, interrupt handling, Timing subroutines.

UNIT 4: **12 L**

Designing Using Microcontrollers

Music box, Mouse wheel turning, PWM motor control, Aircraft Demonstration, ultra sonic distance measuring, Temperature Sensor, Pressure Sensor, Magnetic Field Sensor

UNIT 5: **7 L**

Introduction to RTOS

Task and task states, Task and data, Semaphores, Shared data, Message queues, Mailboxeds and pipes, Timer functions

Text Books:

1. Embedded System Design by Frank Vahid, John Wiley & Sons
2. Embedded Software Primer by David Simon, Pearson
3. Programming and Customizing the 8051 Microcontroller :Predko ; TMH

Reference Books:

1. The 8051 Microcontroller And Embedded Systems Using Assembly And C, 2/E ByMazidi
2. Designing Embedded Hardware: John Catsoulis; Shroff Pub. & Distr. ND.
3. Programming Embedded Systems in C and C++ : Michael Barr; Shroff Pub. & Distr. ND

Department of Electronics & Communication Engineering
Course Structure for B.Tech. (ECE)
Batch: 2016-20

Course Title: **Signal Condition** **(*UG Elective–4*)**		Course Code: **FA86M0**
Credit: 4	L **3**	T **1**	P **0**
Year: **4th**		Semester: **VIII**

UNIT 1.

Components of Analog Signal Conditioning: Signal level and bias changes, linearization, conversion, filtering and impedance matching, concept of loading. Passive signal conditioners − voltage divider, Wheatstone bridge circuits (Current, Voltage, Balanced and Unbalanced), RC filters, and Active signal conditioners- op-amp based circuits. Standard Signals (Analog).

UNIT 2.

Operational Amplifier: Ideal and practical op-amp, Differential Amplifier-a.c. and d.c. analysis, improving voltage gain using active load etc, current sources, unbalanced op-amp frequency response and stabilizing unbalanced operation, circuit diagram of IC741 and working in detail, a.c. and d.c. characteristics, specifications, measurement of op-amp parameters.

UNIT 3.

Operational Amplifier Circuits in Instrumentation: Voltage follower, inverting and non-inverting Amplifier, Adder, Subtractor, Differential Amplifier, Instrumentation Amplifier, V to I and I to V converter with floating load and grounded load, Integrator, differentiator and compensated differentiator, Precision rectifier- half wave, full wave, absolute value circuits, clipping, clamping circuits, practical clamping circuits, sample and hold circuits, peak detectors, log amplifiers, temperature compensated log amplifier, antilog amplifier, multiplier, divider, comparator, threshold detector, zero crossing detector, window detector, Schmitt trigger, free running multivibrator, Wien-bridge oscillator, Phase shift oscillator, Active filters, Astable, Monostable and Bistable multivibrators, Norton amplifier, Pulse, triangle and Sine wave generator, PLL. Guidelines for analog signal conditioning design, design problems based on these guidelines.

UNIT 4.

Components of Digital Signal Conditioning: Converters – ADC, DAC, V to F (LM331 and 555 timer) and F to V – Types and Structure, conversion, resolution and other characteristics.

Characteristics of digital data – digitized value, sampled data system and linearization, Standard signals (Digital). Data acquisition system hardware, Data Logger.

UNIT 5.

Transducer Signal Conditioning Design: Thermal sensor conditioning−design considerations and applications for RTD, Thermistor, thermocouple and solid state temperature sensors. Optical sensor conditioning- photoconductor, photovoltaic, photodiode, phototransistor, and photomultiplier tube, Optical encoder conditioning forlinear displacement, linear velocity and angular displacement application. Other Sensors conditioning – Potentiometer, LVDT, strain gauges, piezoelectric transducers and capacitive transducers

Books Recommended:

1. Murty D V S, "Transducers & Instrumentation", PHI, New Delhi (2000)
2. Sawhney A K, "Electrical and Electronics Measurements and Instrumentation", DhanpatRai and Sons,New Delhi (2000).
3. Kalsi H S, "Electronic Instrumentation " Tata McGraw Hill, New Delhi, 4thEd. (2001).
4. Patranabis D, "Sensors and Transducers", PHI, New Delhi (2003).
5. Doebelin Ernest O, "Measurement Systems: Application and Design", Tata McGraw Hill, New Delhi (2004).

Department of Electronics & Communication Engineering
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Course Title: **Virtual Instrumentation** **(*UG Elective–4*)**			Course Code: **FA86N0**
Credit: 4	L	T	P
	3	**1**	**0**
Year: **4th**			Semester: **VIII**

UNIT 1:

Virtual Instrumentation: Historical perspective, advantages, blocks diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, comparison with conventional programming. Development of Virtual Instrument using GUI, Real-time systems, Embedded Controller, OPC, HMI / SCADA software, Active X programming.

UNIT 2:

VI programming techniques: VIS and sub-VIS, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O, Instrument Drivers, Publishing measurement data in the web.

UNIT 3:

Data acquisition basics: Introduction to data acquisition on PC, Sampling fundamentals, Input/Output techniques and buses. ADC, DAC, Digital I/O, counters and timers, DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements.

UNIT 4:

Chassis requirements. Common Instrument Interfaces: Current loop, RS 232C/ RS485, GPIB. Bus Interfaces: USB, PCMCIA, VXI, SCSI, PCI, PXI, Firewire. PXI system controllers, Ethernet control of PXI. Networking basics for office & Industrial applications, VISA and IVI.

UNIT 5:

VI toolsets, Distributed I/O modules. Application of Virtual Instrumentation: Instrument Control, Development of process database management system, Simulation of systems using VI, Development of Control system, Industrial Communication, Image acquisition and processing, Motion control.

TextBooks:

1. Gary Johnson, Lab VIEW Graphical Programming, Second edition, McGraw Hill, Newyork, 1997.
2. Lisa K. wells & Jeffrey Travis, Lab VIEW for everyone, Prentice Hall, New Jersey, 1997.

Reference Books:

1. Kevin James, PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control, Newnes, 2000.

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Course Title: **Bio-Medical Instrumentation** **(*UG Elective–4*)**			Course Code: **FA86O0**
Credit: 4	L	T	P
	3	**1**	**0**
Year: **4th**			Semester: **VIII**

UNIT 1. **10 L**

Anatomy and Physiology: Elementary ideas of cell structure, heart and circulatory system, control nervous system, Musclo-skeletal system, Respiratory system Body temperature and reproduction system.

UNIT 2. **2 L**

Classification of Biomedical Equipment: Diagnostic, therapeutic and clinical laboratory equipment

UNIT 3. **14 L**

Bioelectric Signals And Their Recording: Bioelectric signals (ECG, EMG, ECG, EOG & ERG) and their characteristics, Bio-electrodes, electrodes tissue interface, contact impedance, effects of high contact impedance, types of electrodes, electrodes for ECG, EEG and EMG.

UNIT 4. **12 L**

Transducers For Biomedical Application: Resistive transducers - Muscle force and Stress (Strain guge), Spirometry (Potentiont) humidity, (Gamstrers), Respiration (Thermistor); Inductive Transducers - Flow measurements, muscle movement (LVDT) Capacitive Transducers - Heart sound measurement, Pulse pick up Photoelectric Transducers - Pulse transducers, Blood pressure, oxygen Analyses Piezoelectric Transducers - Pulse pickup, ultrasonic blood flow meter; Chemical Transducer - Ag-Agfallas (Electrodes, PH electrode)

UNIT 5. **8 L**

Bioldectric Signal Recording Machines: Physiological pre-amplifier and specialized amplifiers, ECG lead systems details of ECG, EMG, and EEG machines

Recommended Books:

1. Medical Instrumentation; by John. G. Webster –John Wiley
2. Principles of Applied Biomedical Instrumentation; by Goddes& Baker – John Wiley
3. Biomedical Instrumentation & Measurement; by Carr & Brown-Pearson
4. Biomedical Instrument; by Cromwell-Prentice Hall of India, New Delhi
5. Hand book of Medical instruments; by R.S. Khandpur –TMH, New Delhi
6. Medical Electronics and Instrumentation; by Sanjay Guha – University Publication
7. Introduction to Biomedical electronics; by Edwand J. Bukstein –sane and Co. Inc.USA

Department of Electronics & Communication Engineering
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Course Title: **Spread Spectrum Systems**	Course Code: **FA8010**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VIII**

UNIT 1

Introduction: Introduction to spread spectrum, spread spectrum techniques, Direct sequence system, frequency hopping systems, pulse FM(chirp) system, hybrid systems

UNIT 2

Coding for Communication and Ranging: Property of codes for spread spectrum, Autocorrelation and cross correlation of codes, composite codes, code selection and signal spectra, error detection and correlation codes.

UNIT 3

Modulation and Demodulation:– Balance modulator, quadric-phase modulator, frequency synthesis for spread spectrum modulation, in line and heterodyne correlation, base band recovery, phase lock loop, COSTAS loop, FM feedback, PDM and FH demodulators.

UNIT 4

Need for Synchronization: types of synchronizers, RF link- Noise figure, co-channel users, dynamic range and AGC, propagation medium, overall transmitter and receiver design.

UNIT 5

Test and Evaluation of Spread Spectrum System: selectivity, sensitivity, jamming margin, synch acquisition, processing gain. Transmitter measurements.

Suggested Books:

1. R. C. Dixon, "Spread Spectrum Systems with Commercial Application", John Wiley, 3rd Ed.
2. H. Taube and D. L. Schilling, "Principles of Communication Systems", Tata McGraw Hill, 2nd Ed. Reprint 2007.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
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Course Structure & Detailed Syllabus

of

B. Tech. in Electrical Engineering

Batch 2016-20

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Year: 1st **Semester: I**

Course Code	Course Title	L	T	P	Credit
JA1010	Engineering Mathematics-I	3	1	0	3.5
BA1210	Engineering Chemistry	3	1	2	4.5
EA1210	Introduction to Electrical Engineering	3	1	2	4.5
FA1210	Introduction to Electronics & Communication	3	1	2	4.5
HA1210	Professional Communication-I	3	1	0	3.5
DA1210	Computer Fundamental & C Programming	3	0	2	4
LA1110	Workshop Practice	0	0	2	1
	Total				**25.5**

Year: 1st **Semester: II**

Course Code	Course Title	L	T	P	Credit
JA2010	Engineering Mathematics-II	3	1	0	3.5
OA1210	Engineering Physics	3	1	2	4.5
LA1210	Essentials of Mechanical Engineering	3	1	2	4.5
HA2210	Professional Communication-II	3	0	1	3.5
DA2210	Computer Programming in C++	3	0	2	4
BA1010	Environmental Science	2	0	0	2
LA1220	Engineering Graphics	1	0	0	1
HA1310	Soft Skills Development	0	0	2	1
	Total				**24**

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Year: 2nd **Semester: III**

Course Code	Course Title	L	T	P	Credit
EA3210	Basic Network Analysis	3	1	2	4.5
EA3220	Electrical Measurement & Measuring Instruments	3	1	2	4.5
EA3230	Electromechanical Energy Conversion - I	3	1	2	4.5
JA3010	Engineering Mathematics - III	3	1	0	3.5
FA3290	Analog & Digital Electronics	3	1	2	4.5
LA30A0	Hydraulic Machines	3	0	0	3
	Total				**24.5**

Year: 2nd **Semester: IV**

Course Code	Course Title	L	T	P	Credit
EA4210	Electromechanical Energy Conversion - II	3	1	2	4.5
EA4220	Network Analysis & Synthesis	3	1	2	4.5
EA4230	Microprocessors	3	1	2	4.5
EA4010	Electrical Power Generation	3	1	0	3.5
EA4020	Engineering Materials	3	1	0	3.5
	Inter Departmental Elective	3	1	0	3.5
EA4310	Value Added Training - I	0	0	2	1
EA4410	Industrial Tour	0	0	2	1
	Total				**26**

List of Inter Departmental Elective	
JA4610	Numerical Techniques
LA6040	Operation Research

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Year: 3rd **Semester: V**

Course Code	Course Title	L	T	P	Credit
EA5210	Power Electronics	3	1	2	4.5
EA5220	Control System	3	1	2	4.5
EA5010	Elements of Power System	3	1	0	3.5
EA5020	Fundamental of EM Theory	3	1	0	3.5
GC5010	Engineering Economics	2	0	0	2
DA3210	Data Structure	3	0	2	4
EA5310	Aptitude Building-1	0	0	2	1
	Total				**23**

Year: 3rd **Semester: VI**

Course Code	Course Title	L	T	P	Credit
EA6210	Switchgear & Protection	3	1	2	4.5
EA6220	Instrumentation & Process Control	3	1	2	4.5
EA6010	Power System Analysis	3	1	0	3.5
EA6020	Modern Control System	3	1	0	3.5
FA63E0	Principles of Communication Engineering	3	1	0	3.5
HA5010	Principles of Management	2	0	0	2
EA6310	Aptitude Building II	0	0	2	1
EA6110	Project Phase I	0	0	4	2
	Total				**24.5**

After VI semester student will undergo minimum 6 weeks Industrial Training which will be evaluated in the VII semester.

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Year: 4th **Semester: VII**

Course Code	Course Title	L	T	P	Credit
EA7210	Electric Drives	3	1	2	4.5
EA7010	ANN & Fuzzy Logic	3	1	0	3.5
EA7020	Power System Operation & Control	3	1	0	3.5
EA7030	Electrical Machine Design	3	1	0	3.5
	Departmental Elective–I	3	1	0	3.5
EA7510	Industrial Training & Presentation*	0	0	2	4
EA7110	Project Phase II	0	0	4	2
	Total				**24.5**

* During Summer Vacation after VI semester students are compulsorily required to attend Industrial Training of 6-8 weeks which will be evaluated in VII Semester under Industrial Training Presentation (EA7510).

Lists of Departmental Elective-I	
EA7610	High Voltage Engineering
EA7620	FACTS Devices
EA7630	Power Converter Applications
EA7640	Bio Instrumentation

Year: 4th **Semester: VIII**

Course Code	Course Title	L	T	P	Credit
	Elective II	3	1	0	3.5
	Elective III	3	1	0	3.5
	Elective IV	3	1	0	3.5
	Elective V	3	1	0	3.5
	Open Elective	3	0	0	3
EA8A10	Project Phase III	0	0	8	4
	Total				**21**

Lists of Departmental Elective-II, III, IV, V		
Elective II	EA8620	Telemetry and Data Acquisition System
	EA8630	Non-Conventional Energy Resources
Elective III	EA8640	Special Electrical Machines
	EA8670	Utilization of Electrical Energy & Traction
Elective IV	EA8650	Power Quality & Its Improvement Techniques
	EA8660	Switch Mode & Resonant Converters
Elective V	EA8610	EHV AC & DC Transmission

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List of Open Electives (To be conducted in VIII Semester)

Sl. No.	Branch	Subject Code	Name of Elective subjects
1	Physics	OA8710 OA8720	1. Nano Scale Science and Technology 2. Photonics Technology
2	EE	EA8710 EA8720	1. Non-Conventional Energy Resources 2. Instrumentation and Process control
3	ME	LA8710 LA8720	1. Entrepreneurship development 2. Quality Management
4	Civil	CA8710 CA8720	1. Environment and Ecology 2. GIS
5	CSE	**DA8740** DA8710	1. Management Information System (MIS) 2. Business Intelligence
6	IT	IA8730 IA8721	1. Internet of Things 2. IT In Business
7	ECE	FA8710	1. Consumer Electronics
8	Humanities	HA8710 HA8720	1. Industrial Psychology 2. Human Values and Ethics
9	MBA	GA8710 GA8730 GA8740	1. Organizational Behavior 2. Digital Marketing 3. Financial Modeling with Spread sheet

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Course Title: **Engineering Mathematics-I**	Course Code: **JA1010**
Credit: **3.5**	L **3** T **1** P **0**
Year: **1st**	Semester: **I**

UNIT I: Differential Calculus-I [**9**]

Functions of single variable: Limit continuity and differentiability; Indeterminate forms; Mean value theorems; Role's Theorem; Taylor's theorem with remainders; Curve tracing.

UNIT II: Differential Calculus-II [**9**]

Successive differentiation; Leibnitz theorem; Partial differentiation; Euler's theorem; Expansion of functions of several variables; Extrema of functions of several variables; Lagrange's method of multipliers.

UNIT III: Integral Calculus [**9**]

Improper integral-Beta and Gamma functions; Double and Triple integrals; change of order of integration; change of variables; Dirichlet's integral and its applications; Application of multiple integral.

UNIT IV: Vector Calculus [**12**]

Vector Differentiation: Scalar and vector fields; gradient of scalar point function; directional derivatives; divergence and curl of vector point function; solenoidal and irrotational vectors.

Vector Integration: line, surface and volume integrals; Green's theorem; Stokes' theorem and Gauss divergence theorem (without proof).

Text Books:

- R. K. Jain & S. R. K. Iyenger, **Advanced Engineering Mathematics**, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.

Reference Books:

- E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, John &Wiley Sons, U.K., 2006.
- B. S. Grewal, **Higher Engineering Mathematics**, 42th Edition, Khanna publication, New Delhi, India, 2012.

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Course Title: **Engineering Chemistry**	Course Code: **BA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **I**

UNIT – I

Water Chemistry

Introduction, Analysis of Water – Alkalinity, Chlorides and Dissolved Oxygen, Hardness of Water - Temporary and Permanent hardness, Estimation of hardness by EDTA Method, Disadvantages of Hard Water, Numerical problems.

Water for Industrial purpose – Boiler Feed Water, Boiler Troubles (Priming and Foaming, Boiler Corrosion, Scales and Sludges, Caustic Embrittlement), Water Treatment: Internal Treatment (Colloidal, Phosphate, Calgon, Carbonate Conditioning), External Treatment (Lime-Soda Process, Zeolite Process, Ion- Exchange Process), Numerical Problems.

UNIT – II

Physical Chemistry

Electrochemistry: Reference electrodes, Ion selective electrodes, Chemically modified electrodes as sensors, Electrochemical energy systems, Lithium batteries, Fuel cells.

Thermochemistry: Hess's Law, Heat of a reaction, Effect of temperature on heat of reaction at constant pressure (Kirchoff's eq.), Heat of dilution, Heat of hydration, Heat of neutralization and Heat of combustion.

Surface chemistry: Surface and interfacial tension, Capillary pressure.Adsorption phenonmenon, Adsorption of gaseson solids, Frendlich and Langmuir adsorption isotherms,Role of adsorbents in catalysis, ion-exchange and pollution abatement.

UNIT – III

Science of Corrosion and Protective Coatings

Introduction, Types of Corrosion, Theories of Corrosion and Mechanism, Factors Influencing Corrosion.Control of Corrosion.

Types of Protective Coatings: Metallic Coatings, Anodic Coatings, Galvanization, Cathodic Coatings, Tinning, Metal Cladding, Electroplating (Chromium Plating, Metal Spraying, Cementation-Sheradizing, Colourizing, Chromizing).

UNIT – IV

Introduction to Polymers and Nano-materials

Polymerization, Classification of polymers, Addition and Condensation Polymerizations. Plastics - Thermosetting and Thermoplastics. Preparation, Properties and Uses of Polyethylene, PVC, Teflon, Bakelite, Nylon, Polyester, Polyurethane, Ziegler-Natta catalyst, conducting polymers.Rubber- Processing of Natural Rubber, Vulcanization and Compounding. Elastomers: Buna-S, Buna- N, Thiokol.

Introduction to Nano-materials: Fullerenes, Nano-tubes, Nano-wires, Nano-cones, Nano-dots, Nano-sphere, Haeckelites. Their electronic and mechanical properties, Production methods for CNTs. Applications of nano materials in i) Medicine ii) Catalysis iii) Environmental Technologies iv) Electronics& related fields. v) Mechanics.

UNIT – V

Fuels & Lubricants

Fuels: Classification, crude oil: composition and fractionation, Octane & Cetane Number and their significance; calorific value of fuel, Determination of calorific value of fuels, bomb calorimeter, Solid fuels - Proximate and ultimate analysis, Numericals problems.

Lubricants: Functions of lubricants, Mechanism of Lubrication (thick film or hydrodynamic lubrication, thin film or boundary lubrication, extreme pressure lubrication), Classification and properties of lubricants- Viscosity, Flash and fire point, Cloud and pour point, Aniline point, Neutralization number and mechanical strength. Numerical problems on acid value and saponification value.

Text Books:

1. Chemistry in Engineering & Technology (Vol I & II) (Latest ed.) By J.C. Kuriacose& J. Rajaraman, Tata McGraw-Hill Co, New Delhi.
2. Engineering Chemistry by O.G. Palanna, Tata McGraw-Hill Co, New Delhi.

Reference Books:

1. Atkins' Physical Chemistry by Peter W. Atkins and Julio de Paula, Oxford University Press.
2. Principles of Physical Chemistry (Latest ed.) By Puri, Sharma & Pathania.
3. Organic chemistry, Morrison and Boyd, Pearson Prentice Hall, 2011
4. Environmental chemistry, S.E. Manahan, 9th edition, CRC Press.
5. Textbook of polymer science by F.W. Billmeyer, Wiley India.

Engineering Chemistry Lab

List of Experiments

1. Estimation of hardness of water by EDTA method
2. Estimation of total alkalinity in the given water sample.
3. Estimation of dissolved oxygen in the given water sample.
4. Estimation of available chlorine in the given sample of bleaching powder.
5. pH-metric titration.
6. Determination of viscosity of lubricants by Redwood viscometer / Ostwald's viscometer.
7. Determination Surface Tension of lubricants.
8. Determination of Flash point of a given oil by Pensky_Marten's flash point approach.
9. To Determine Saponification-value of the given Lubricating Oil.
10. To Determine Acid-Value of the given Lubricating Oil.
11. To determine the moisture, volatile and ash contents in a given coal sample by proximate analysis.
12. To study the adsorption of acetic acid on activated charcoal.

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Course Title: **Introduction to Electrical Engineering**	Course Code: **EA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **I**

UNIT – 1
D.C. NETWORK THEORY
Review of basic circuit theory concepts, Mesh and Nodal analysis, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Star–delta transformation, Magnetic Circuits.

UNIT – 2
A.C. CIRCUITS & MEASURING INSTRUMENTS
*Single Phase A.C.:*Phasor representation of voltage and current, A.C. circuit behavior of resistance, inductance, capacitance & their combination in series and parallel, Power triangle, Power factor, Concept of series & parallel resonance.
*Three Phase A.C.:*Star – delta connections, Relation between line and phase quantities, three phase power and its measurement, What is 3 phase 4 wire and 3 phase 5 wire system?
Measuring Instruments: Construction and principle of voltage and current measuring instruments.

UNIT – 3
TRANSFORMERS
Principle of operation, Types of construction, Phasor diagram, Equivalent circuit, Efficiency and voltage regulation of single phase transformer, O.C. and S.C. tests.

UNIT – 4
D.C. & SYNCHRONOUS MACHINES
D.C. Machines: Construction and working principle of d.c. generator and d.c. motor, Types of d.c. machines, E.M.F. equation, Torque equation, Magnetization and load characteristics, Losses and efficiency, Need of starter in d.c. motors.
Synchronous Machines: Construction and Principle of operation of Alternator and Synchronous Motor.

UNIT – 5
INDUCTION MOTORS
Three Phase Induction Motors: Principle of operation of 3-Ø induction motor, Types of 3-Ø induction motor, Need of starters in 3-Ø induction motors, Slip – torque characteristics,
Single Phase Induction Motor: Principle of operation of single phase induction motor, Methods of starting of single phase induction motor.

Reference Books:
1. V. Del Toro. " Principles of electrical Engineering, "Prentice hall International.
2. W.H. Hayt& J.E. Kemmerly," Engineering circuit Analysis, "McGraw Hill.
3. I. J. Nagrath, "Basic Electrical Engineering," Tata Mc. Graw Hill.
4. A. E. Fitgerald, D.E., Higginbotham and A Grabel, "Basic Electrical Engineering" McGraw Hill
5. H. Cotton, "Advanced Electrical Technology" Wheeler Publishing.

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Basic Electrical Engineering Lab

(Any Ten)

1. Verification of Network Theorems.
2. Study of diode characteristics. Study of phenomenon of resonance in RLC series circuit.
3. Measurement of power in a three phase circuit by two wattmeter method.
4. Measurement of efficiency of a single phase transformer by load test.
5. Determination of parameters and losses in a single phase transformer by OC and SC test.
6. Study of characteristic of DC Motor.
7. Study of characteristic of AC Motor.
8. DC generator characteristics.
9. 10. Speed control of dc shunt motor.
10. Study running and reversing of a three phase induction motor.
11. Study of a single phase energy meter.

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Batch: 2016-20

Course Title: **Introduction to Electronics & Communication**		Course Code: **FA1210**
Credit: **4.5**	L **3**	T **1**	P **2**
Year: **1st**		Semester: **I**

UNIT 1: Fundamental of Semiconductors ***10 L***

Energy bands in semiconductors, intrinsic and extrinsic semiconductors, Fermi Level in Intrinsic and Extrinsic semiconductor, Carrier transport in semiconductors: diffusion current, drift current, mobility, Hall Effect and resistivity. Generation and recombination of carriers.

UNIT 2: Application of Low Power and High Power Diodes ***10 L***

Diode circuits: Construction, Junction diode characteristics, Half and full wave rectifiers - Expression for efficiency and ripple factor - Bridge rectifier – π Filter circuits, Clipper, Clamper and multipliers using diodes, Zener Diode Characteristics - Regulated power supply using Zener diode.

UNIT 3: Transistor fundamentals ***8 L***

Transistor circuits: Characteristics of a transistor in CB, CE and CC modes - Relatively merits - Biasing of Transistors - Load Line and operating point concept (both AC and DC). Construction and working of JFET and MOSFET.

UNIT 4: Digital fundamentals and Introduction to Signals ***8 L***

Basic logic gates: AND, OR, and NOT – implementation of all gates using Universal gates, Number Systems conversions, Boolean algebra, K-map (upto 4 variables). Source of Information, Types of Signals.

UNIT 5: Basics of Communications & Instrumentation ***9 L***

*C*ommunication Systems, Communication Channels, Need of modulation, Types of modulations (Wave shapes and final expression only), Study of Piezoelectric, PMMC, LVDT and Strain Gauge transducers and their classifications and display device (7 segment) only.

Reference Books:

Unit 1. Electronics Devices and Circuits, Millman and Halkias, Tata McGraw Hill, 4th ed.
Unit 2 & 3. Electronic Devices and Circuit Theory, Robert L. Boylestad, Prentice Hall Higher Edu., 2000.
Unit 4. Digital Design, Morris Mano, PHI
Unit 4. Modern Digital & Analog Communications, B. P. Lathi, OUP
Unit 5. Electronic Communication Systems, John Kennedy , Tata McGraw Hill, 4th ed.
Unit 5. Electronic Instrumentation - H. S. Kalsi

ELECTRONICS ENGINEERING LAB.

1. To identify and Study of the various component and Devices of electronics with their specification (CRO, Function Generator, Multimeter, Power Supply, resistor, capacitor, inductor, ICs, LED, potentiometer etc.)
2. To study the V-I characteristics of PN diode and Zener diode.
3. To find the efficiency of Rectifiers and ripple factor of capacitive and non-capacitive half wave and full wave rectifier.
4. To Study and Verify clipper and clamper with biased circuits.
5. To find the characteristics of CB and CE amplifiers.
6. Determine the characteristics of FET.
7. To find out the power energy of various periodic and non periodic signals.
8. To verify the logic gates using diodes.
9. Study and observations of AM & FM Waveforms.
10. Study of various transducers (Strain Gauge).

***** *Plus 2-3 value added experiments can be performed.*

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Course Title: **Professional Communication – I**			Course Code: **HA1210**
Credit: **3.5**	L **3**	T **1**	P **0**
Year: **1st**			Semester: **I**

UNIT 1: **COMMUNICATION** **(6 Hrs)**

1. Communication: Definition and Process of Communication.
2. Types of Communication: Formal and Informal Communication, Verbal and Non-Verbal Communication.
3. Barriers to Communication: Intrapersonal and Interpersonal Barriers. Semantic Barriers, Physical Barriers, Psychological Barriers, and Organizational Barriers.

UNIT 2: **LISTENING SKILLS & SPEAKING SKILLS** **(8 Hrs)**

1. Importance and Objective of Listening Skills, Process of Listening, Listening and Hearing, Types of Listening, and Methods for Improving Listening Skills
2. Listening Comprehension: Identifying General and Specific Information.
3. Listening for Note taking and drawing Inferences.
4. Importance of Speaking Skills, Types of Speaking, Methods for Improving Speaking Skills
5. Introduction to Phonetic Transcription: Familiarization with British and American Usage.

UNIT 3: **READING SKILLS** **(4 Hrs)**

1. Importance of Reading Skills, Types of Reading Skills, Methods of Improving Reading Skills.
2. Vocabulary Building: Antonyms, Synonyms, Homophones, Homonyms, and One-Word Substitution, Etymology and roots.

UNIT 4: **WRITING SKILLS** **(10 Hrs)**

1. Importance of Writing Skills, Types of Writing Skills, and Methods for Improving Writing Skills.
2. Sentence and Paragraph Construction. Writing Expository, Argumentative and Deductive Order etc Paragraphs.
3. Précis Writing
4. Basic Letter Writing: Format and Style of Formal Letters.

UNIT 5: **ONE ACT PLAY** **(6 Hrs)**

Practice of LRSW through the study of the one act play, ***THE REFUND*** by **Fritz Karinthy**.

TEXT BOOK

1. Gupta, Ruby. Basic Technical Communication, Cambridge University Press, New Delhi.2012.

REFERENCE BOOKS

1. Rizvi, Ashraf. Effective Technical Communication, McGraw Hill, New Delhi. 2005
2. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011
3. Tyagi, Kavita& Padma Misra. Basic Technical Communication, PHI, New Delhi. 2011
4. Lewis, Norman. Word Power Made Easy, W.R Goyal Pub. & Distributors.1995
5. Ford A, Ruther. Basic Communication Skills; Pearson Education, New Delhi.2013
6. Aslam, Mohammad. Introduction of English Phonetics and Phonology Cambridge.2003
7. Kameswari, Y. Successful Career Soft Skills and Business English, BS Publications, Hyderabad.2010
8. English Pronouncing Dictionary, Cambridge.2012
9. The Oxford Guide to Writing and Speaking. OUP, Delhi.2011

Professional Communication – I Lab

Lab 1	Neutralization of Mother Tongue Influence through manner of articulation
Lab 2	Common Errors in English and Indianisms.
Lab 3	Introduction to Speech Sounds – Practicing Vowel and Consonant sounds
Lab 4	Syllable, word stress, Sentence stress
Lab 5	Pause group, Intonation & Rhythm
Lab 6	Functional English
Lab 7 & 8	Everyday Conversation : Greetings, Apologies, Requests, At a Restaurant, Shopping, Groceries, Hiring an Apartment, Travel Courses, etc.
Lab 9	Developing Listening skills through cultural movies
Lab 10 &11	Movie - To provide exposure to the target language
Lab 12	Final evaluation based on Extempore

References: (Software and Videos)

1. Wordsworth English Language laboratory software
2. Wordsworth Prep 1-2-3
3. Connected Speech Level 1-2-3
4. Learn To speak English CD 1-2-3-

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Computer Fundamentals and 'C' Programming**			Course Code: **DA1210**
Credit: **4**	L **3**	T **0**	P **2**
Year: **1st**			Semester: **I**

UNIT 1 **(8 L)**

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system: Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

UNIT 2 **(8 L)**

Standard I/O in C, Fundamental data types- Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external**,** Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Fundamentals of C programming: Structure of C program**,** writing and executing the first C program, components of C language. Standard I/O

UNIT 3 **(8 L)**

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch**,** program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break, continue and goto statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

UNIT 4 **(8 L)**

Arrays: Array notation and representation, manipulating array elements using one and two dimensional arrays, linear searching, sorting (bubble sort), strings, matrix manipulation (transpose, addition, multiplication).

Structures: Purpose and uses of structures, declaring structures, array of structures, union, enumerated data types

UNIT 5 **(8 L)**

Pointers: Pointers: pointer variables, pointer operator, pointer expression, array of pointers, multiple indirection, pointers to functions, dynamic memory allocation functions.

File handling**,** standard C preprocessors**,** defining and calling macros, conditional compilation.

Text Books:

1. YashwantKanetkar, "Let us C", BPB Publications, 2nd Edition, 2001.
2. Herbert Schildt, "C:The complete reference", OsbourneMcgraw Hill, 4th Edition, 2002.
3. Computer Fundamentals and Programming in C. ReemaThareja, Oxford Publication
4. P.K. Sinha "Computer Fundamentals" B.P.B Publication.

Reference Books:

1. Raja Raman, "Computer Programming in C", Prentice Hall of India, 1995.
2. Kernighan & Ritchie, "C Programming Language", The (Ansi C Version), PHI, 2nd Edition.
3. Byron Gottfreid "Schaum's Outline of Programming with C".

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20
List of Programs in 'C' Lab

Lab 1	(a) WAP to perform simple arithmetic operations using different data types. (b) WAP to show swap of two no's without using third variable.
Lab 2	(a) WAP to find the roots of a quadratic equation. (b) WAP to check the number is odd or even and find the sum of all odd and all even separately.
Lab 3	(a) WAP to find out whether the given number is prime or not. Find sum of all prime upto N. (b) WAP to reverse a given number and check the palindrome status.
Lab 4	WAP to print corresponding days of a week using switch case.
Lab 5	WAP to find and generate the Armstrong number.
Lab 6	WAP to print pattern triangle like Floyd's, Pascal, pyramid triangle.
Lab 7	(a) WAP to interchange two values using call by value and call by reference. (b) WAP to print factorial of a number using recursion & without using recursion.
Lab 8	WAP to print Fibonacci series. (**a**) Without using function (**b)** using function (**c)** using recursion
Lab 9	(a) WAP to print an array and find greatest/smallest element of an array. (b) WAP to perform linear searching in an array.
Lab 10	(a) WAP to insert/ delete element from an array. (b) WAP to sort the array's element using Bubble sort.
Lab 11	WAP to perform the following string functions. **a.** Strlen **b**. strcmp **c.**strcpy **d**. strcat **e**. strlwr **f**.strupr
Lab 12	Declare a suitable structure of a college and print the name and DOB of the student have scored more than sixty percent marks in end semester exam.
Lab 13	Declare a suitable structure for an organization and print all the names of employees having salary more than Rs.1000.

Course Title: **Workshop Practice**			Course Code: **LA1110**
Credit: **1**	L **0**	T **0**	P **2**
Year: **1st**			Semester: **I**

List of Experiments

1. Carpentry: To make a T-Lap joint with soft wood.
2. Arc Welding: To make a Lap joint with mild steel flat by arc welding process.
3. Gas Welding: To make a Lap joint of M.S. sheet with gas welding process.
4. Fitting: To make a plug and socket joint with M.S. flat.
5. Machine Shop: To turn a M.S. rod on lathe to prepare a turning specimen.
6. Sheet Metal: To make a square tray with G.I. sheet.
7. Study of Foundry and Forging tools and equipments

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Engineering Mathematics – II**	Course Code: **JA2010**
Credit: **3.5**	L **3** T **1** P **0**
Year: **1st**	Semester: **II**

UNIT I: **(10L)**

Linear Algebra

Matrices; Inverse of matrix; Echelon form; Rank of matrix; Consistency and solution of a system of linear equations; Linear dependence and independence of vectors; Matrix transformations; Eigen values and eigenvectors; Cayley– Hamilton theorem; Reduction to diagonal form; Vector spaces; Sub spaces; Basis; Dimension; Linear Transformation**.**

UNIT II: **(8L)**

Differential Equations

Linear differential equations first order and first degree; Linear differential Equations of higher orders with constant coefficients; Complementary functions and Particular integrals; Euler-Cauchy linear differential equations; Simultaneous linear differential equations; Method of variation of parameters.

UNIT III: **(6L)**

Infinite Series

Introduction; Sequences; Series; Convergence; Series of positive terms; Comparison test; Integral test; D'Alembert's Ratio test; Cauchy's root test; Alternating series; Leibnitz rule.

UNIT IV: **(8L)**

Fourier Series

Periodic functions; Fourier series of Periodic functions; Euler's formulae; Functions having arbitrary period; Change of intervals; Even and Odd functions; Half range sine and cosine series.

UNIT V: **(8L)**

Laplace Transform

Laplace Transform; Existence theorem; Properties of Laplace Transform ; Laplace Transform of derivatives and integrals; Laplace Transform of Periodic functions; Unit Step function and Error Function; Dirac- Delta function; Unit impulse function; Convolution theorem; Applications of Laplace Transform to solve linear and simultaneous differential equations.

Text Books:

1. R. K. Jain & S. R. K. Iyenger, **Advanced Engineering Mathematics**, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.
2. E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, John Wiley & Sons, U.K., 2006.

Reference Books:

1. W. E. Boyce and R. Di Prima, **Elementary Differential Equations**, (8th Edition), John Wiley & Sons, U.K., (2005).
2. B. S. Grewal, **Higher Engineering Mathematics**, 42nd Edition, Khanna Publication, New Delhi, India, 2012.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Engineering Physics**	Course Code: **OA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **II**

UNIT I:
Relativistic Mechanics: Inertial and Non-inertial Frames; Postulates of Special Theory of Relativity; Galilean and Lorentz Transformation; Length Contraction and Time Dilation; Addition of Velocities; Variation of Mass with Velocity and Mass Energy Equivalence.

UNIT II:
Interference: Introduction; Coherent Sources; Analytical treatment of interference; Young's double slit experiment and its analysis; Conditions of Interference; Fresnel's Biprism; fringes with white light; Determination of wavelength of monochromatic light by using Fresnel's Biprism method; Displacement of Fringes; Interference in plane parallel thin film (reflected and transmitted light) and wedge shaped film(reflected light only); Newton's Rings; Determination of wavelength of monochromatic light and determination of refractive index of a liquid by using Newton's ring method.

UNIT III:
Diffraction: Introduction; Difference between Interference and diffraction; resultant of superposition of n simple harmonic coherent vibrations; Fraunhofer diffraction due to single slit: resultant intensity; conditions of maxima; minima; angular and linear width of central maximum; Double slit diffraction: resultant intensity; missing order; N-slit diffraction : resultant intensity; conditions of maxima and minima; missing orders; angular width of principal maxima; Diffraction grating: formation of spectra and missing order spectra in spectrum; dispersive power of grating; Resolving power; Rayleigh Criterion of resolution; Resolving power of plane transmission diffraction grating.

UNIT IV:
Polarization: Polarised and unpolarised light and its pictorial representation; plane of polarisation and plane of vibration; Phenomenon of Double Refraction; positive and negative double refracting crystals; properties of ordinary and extra-ordinary Rays; Nicol Prism and its application as a polariser and analyser; Mathematical analysis of superposition of two linearly polarised light vectors; retardation plates – half wave plate and quarter wave plate; Production and detection of Plane; Circularly and Elliptically Polarized Light.
Laser: Spontaneous emission; stimulated emission and stimulated absorption; Einstein's A and B Coefficients and relation between them; Principle of Laser Action; Construction and Working of He-Ne; Semiconductor Laser.

UNIT V:
Wave Mechanics : Wave Particle Duality; de Broglie Concept of Matter Waves; Davisson and Germer experiment; Concept of wave packet; group and phase velocity; Heisenberg Uncertainty Principle and its applications viz. non existence of electron in nucleus; radius and energy of Bohr's first orbit; Schrödinger time independent and time dependent wave equation; Physical interpretation of wave function; Application of Schrodinger wave equation: Particle in a one dimensional box (eigen function and eigen values).
Introduction to Fibre Optics: Fundamental ideas about optical fiber; Types of fibers; Acceptance angle and cone; Numerical Aperture.

Text Books:

1. AjoyGhatak**; Optics;** Tata Mc-Graw Hill Education;2009.
2. Subramanyam; BrijLal;**A Text Book of Optics**; S. Chand, 2004.
3. K. Thyagarajan, AjoyGhatak; **Lasers: Fundamentals and Applications**; Second;Springer, 2010.
4. AjoyGhatak& K. Thyagarajan ;**Introduction to Fiber optics;**Cambridge University Press,1998.
5. Halliday, Resnick& Walker; **Principles of Physics**; Nineth, Wiley, India;2013

Reference Books:

1. Arthur Beiser ;**Concepts of Modern Physics**; Tata Mc-Graw Hill Education;2003.
2. Robert Resnick;**Introduction to Special theory of Relativity** ; First; John Wiley& Sons; 1968.
3. Jenkins and White ;**Fundamentals of Optics**; Fourth; McGraw-Hill;2001
4. David. J. Griffith; **An Introduction to Quantum Mechanics**;Second; Pearson prentice Hall; 2004.
5. Young and Freedman;**Sears and Zemansky's University Physics**,Tenth; Addison-Wesley, 2000.

List of Experiments

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help ofFresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locatethe position of cardinal points.
4. To determine the specific rotation of cane sugar solution using bi quartz polarimeter.
5. To determine the wavelength of spectral lines using plane transmissiongrating.
6. To determine the specific resistance of the material of given wire usingCarey Foster's bridge.
7. To determine the variation of magnetic field along the axis of a currentcarrying coil and then to estimate the radius of the coil.
8. To verify Stefan's Law by electrical method.
9. To calibrate the given ammeter using potentiometer.
10. To calibrate the give voltmeter using potentiometer.
11. To determine energy band gap of a given semiconductor material by p-n junction method.
12. To determine the viscosity of water by Poisseuille's method.

Note: Additional experiments may be added based on contents of syllabus.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Essentials of Mechanical Engineering**			Course Code: **LA1210**
Credit: 4.**5**	L **3**	T **1**	P **2**
Year: **1st**			Semester: **II**

UNIT – I **9L**

Introduction to Engineering: Difference between Science and Technology, history of wheel, introduction to prime movers, transmission system, belt, pulleys, gear system and nomenclature, braking system, Mechanism, lever mechanism, Working principle of power generation system, hydel power plant, thermal power plant and its main components.

Coplanar Force system: Resolution of force in two mutually perpendicular direction Free Body Diagram, Moment, Varignon's theorem, static equilibrium, Lami'sTheorem, type of joints/Support, Type of load: point load, uniformly constant and varying loads, beam and its type.

UNIT – 2 **7L**

Engineering material and their properties: Details of hook's law, Proportional limit, Yield point, Yield Stress, Engineering strain, Engineering stress, True stress and Strain, Plasticity, Elasticity, Allowable Strength, Hardness, Ductility, toughness, Fatigue, creep, strain energy, Impact Strength, Young modulus of Elasticity, Bulk Modulus, Poission Ration and its relation in between.

Stress and strain: Normal stress and strain, principle of Superposition, Deformation in stepped and composite bar.

UNIT – 3 **7L**

Thermodynamics: Macroscopic & microscopic study point of view, System, Surrounding and Universe, Phase, Property, State, Path, Process, Cyclic and non-cyclic processes, Quasi static process, Reversible and irreversible processes , Thermodynamic equilibrium, Concept of continuum, Energy and its forms, Enthalpy, Zeroth law, Different temperature scales and theory of temperature and Pressure measurement.

UNIT – 4 **8L**

Laws of Thermodynamics: Thermodynamic definition of work, Thermodynamic processes, Calculation of work in various processes and sign convention, Non-flow work and flow work, Joules' experiment, First law of thermodynamics, Internal energy and enthalpy, First law of thermodynamics applied to open systems, Steady flow energy equation and its applications, First law analysis for closed system (non flow processes), Limitations of first law of thermodynamics, PMM-I.

Statement of Second Law of Thermodynamics: Kelvin Planck's statement and Clausius statement and their equivalence.

UNIT – 5 **9L**

Power generation: Air standard cycle**,** IC Engine**,** Carnot cycle, Otto cycle, Diesel cycle, Important components of I.C.Engine, two stroke and four stoke engine, S.I. and C.I. engines, efficiency of Otto and diesel cycle

Basics of Heat Transfer: Concepts of the mechanisms of heat flows: conduction, convection and Radiation heat transfer application in engineering.

Reference Books:

1. Basu,A.R; A Text book of Engineering Mechanics(Applied Mechanics);2003 Edition; Dhanpat Rai & co.(p) Ltd, Delhi.
2. Chandramouli, P.N; Engineering Mechanics; Second Printing; PHI Learning Private Limited, Delhi; 2013.
3. Rajput, R. K; Material Science; S. K. Kataria & Sons, New Delhi.
4. Dubey, N. H; Engineering Mechanics, Statics and Dynamics; First reprint; McGraw Hill Education (India) Private Limited, New Delhi, 2013.
5. Ratan, S.S; Theory of machines; Second Edition; Tata McGraw Hill Publishing Company Limited, New Delhi.
6. Nag.P.K.; Engineering Thermodynamics; 3rd Edition; Tata McGraw Hill Publishing Company Limited, New Delhi.
7. Nag.P.K.; Heat and Mass Transfer; Tata McGraw Hill Publishing Company Limited, New Delhi.
8. Kumar.D.S; Basic of Mechanical Engineering; S. K. Kataria & Sons, New Delhi.

Essentials of Mechanical Engineering Lab

List of Experiments

1. Tensile test
2. Impact test
3. Hardness test
4. Pulley experiment
5. Experiment on conduction heat transfer
6. Demonstration of Impulse and reaction turbine
7. Study of 4s and 2S engine petrol Engine
8. Study of 4s and 2S engine Diesel Engine
9. Study of refrigerator and air conditioning

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Professional Communication – II**			Course Code: **HA2210**
Credit: **3.5**	L **3**	T **0**	P **1**
Year: **1st**			Semester: **II**

UNIT 1: **PROFESSIONAL COMMUNICATION** **(6 Hrs)**

1. Importance and Features of Business Communication, Flow and Channels of Communication in an Organization.
2. Introduction to Technical Communication, Types and History of Technical Communication.
3. Difference between General and Technical Communication, and Importance of Technical Communication.
4. Characteristic of Technical Communication, and Elements of Style.
5. Process of Preparing a Technical Document.
6. Elements and Features of Scientific Articles.
7. Compunication, E- mail, E- tools and Encyclopedia.

UNIT 2: **BUSINESS CORRESPONDENCE** **(8 Hrs)**

1. Business Correspondence – Principles, Features, Types, Format and Layout of Business Letter.
2. Inter Office Correspondence – Letters of Enquiry, Quotation, Order, Sales, and Complaint.
3. Intra Office Correspondence: Notice, Agenda, Minutes, and Memorandum.
4. Job Application Letter.

UNIT 3: **TECHNICAL PROPOSAL and TECHNICAL REPORT** **(8 Hrs)**

1. Technical Proposal - Introduction, Purpose, Features, Types, Format, Importance, and Writing Technical Proposals and Plagiarism.
2. Technical Report - Features, Types, Style, Format, Relevance, and Writing Technical Reports.

UNIT 4: CORPORATE COMMUNICATION SKILLS **(8 Hrs)**

1. Dimensions and importance of EQ
2. Interpersonal communication skills - Life Position, and Transactional Analysis
3. Johari Window: Role of Feedback and Disclosure in Communication; Accepting Criticism
4. Cross Cultural Communication
5. Attitude
6. Perception
7. Personality Attributes and Communication: Self Esteem, Self-Monitoring, Impression Management, and Locus of Control.
8. Conflict and Negotiation

UNIT 5: PROJECT **(6 Hrs)**

REPORT WRITING/ PROPOSAL WRITING

The students will write a Report **OR** a Proposal consisting of 10-15 pages.

REPORT WRITING

1. **For B.Tech. students-**
    a. Technical Report describing new machinery, a report on the sudden break down in production unit, and market survey report for formulating new market strategy.
2. **For B.Pharma. students**
    a. Technical Report based on the site inspection of a drug manufacturing unit, Survey Report on Health Awareness and Self-Medication.

3. **For B.Arch. students**
    a. Technical Reports based on a Site Inspection for Geographical and Geological aspects of a particular location, A Report on the Architectural Survey of a Monument. Architectural

PROPOSAL WRITING

1. **For B.Tech. students**
    a. Technical Proposal to organize a Technical Training Program, To develop new range of a product and to start a new venture.
2. **For B.Pharma. students**
    a. Technical proposal to establish a new laboratory, To create new drug-composition and to visit to a Super Specialty Hospital.
3. **For B.Arch. students**
    a. Technical Proposal for an Archeological Site visit , To Construct New Buildings.

Report Writing and Proposal Writing carries 30 marks equivalent to three class tests.

TEXT BOOK

1. Gupta, Ruby. Advanced Technical Communication, Cambridge University Press, New Delhi. 2011.

SUGGESTED REFERENCE BOOKS

1. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011.
2. Tyagi, Kavita& Padma Misra. Advance Technical Communication, PHI, New Delhi.2011
3. Technical Communication, Cengage Learning, New Delhi.2010
4. Technical Communication, OUP, New Delhi. 2013
5. Wallace, Masters Personality Development, Cengage Learning, New Delhi.2006
6. Barrass, Robert: Students Must Write, Foundation books, Cambridge, New Delhi.2006
7. Rao, Bhaskar: Successful Career Soft Skills and Business English, BS Publications, Hyderabad.2012
8. Chakrawarthi: Soft Skills for Professionals, Wiley India.2011

Professional Communication – II Lab

Lab 1	Vocabulary Building
Lab 2	Telephone Etiquette: Making an appointment , answering Calls
Lab 3	Public Speaking
Lab 4	Group Discussion: Do's and Don'ts of GD
Lab 5 & 6	Interview Skills: Preparation
Lab 7	PP Presentation Skills: Techniques of making effective presentation
Lab 8	Meeting : Conducting meetings effectively
Lab 9	Developing Negotiating skills
Lab 10 &11	Reading Comprehension
Lab 12	Evaluation

References: (Software and Videos)

1. Wordsworth English Language laboratory software
2. Wordsworth Prep 1-2-3
3. Communicate
4. Train 2 Success
5. Additional PPTs

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Computer Programming in C++**			Course Code: **DA2210**
Credit: **4**	L **3**	T **0**	P **2**
Year: **1st**			Semester: **II**

Unit -1 **8L**

Introduction to Object Oriented Programming, including methodologies, programming techniques, Object Oriented languages.
Overview of C++ basic structures, including the main () function, C++ data types, different type of operators expressions and statements, standard Input/output, Simple flow of control, Defining user defined Functions.

Unit -2 **8L**

General overview of objects and classes, Object and classes in C++, including class definition, Defining members inside or outside, accessing of members, constructors, types of constructors, destructors and Pointer to class object.

Unit-3 **8L**

Polymorphism: function overloading, methods of overloading, constructor overloading, Operator overloading.
General overview of inheritance: Introduction, Categories of inheritance, public/protected/private inheritance, constructors and destructors in derived classes, and Virtual Base class.

Unit-4 **8L**

Function overriding and virtual functions, Abstract class and abstract base class, Friend functions, Templates in C++, function templates, class templates, templates and inheritances, templates and static members.

Unit-5 **8L**

File handing in C++: opening of file, closing of file, text files, binary files, Reading and writing into a file. Exception Handling in C++, including usage, try, throw and catch.

Text Books:

1. Kip R. Irvine, C++ and Object-Oriented Programming, Prentice Hall, 1997
2. R. Lafore, "Object Oriented Programming using C++", BPB Publications, 2004
3. E Balagurusamy "Object Oriented Programming with C++" T.M.H 2nd edition

Reference Books:

1. Schildt Herbert, "C++ Programming", 2nd Edition, Wiley DreamTech.
2. YashwantKanethkar, "Object Oriented Programming using C++",BPB, 2004

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

List of Programs in 'C++' Lab

Lab 1	(a) WAP to print first 10 prime numbers. (b) WAP to demonstrate nested loops. (c) WAP to print reverse of a given number. (d) WAP to read two numbers from keyboard and display the larger one.
Lab 2	(a) Create a class called Employee that includes three pieces of information as instance Variables – a first name (type String), a last name (type String) and a monthly salary (Double) (b) Create a constructor in above class to initialize the three instance variables. Provide a get method for each instance variable. (c) WAP to demonstrate destructors.
Lab 3	(a) Program to implement different types of inheritances like Multiple, Multilevel and hybrid. (b) Write a program in C++ demonstrating the public, protected and private parameters. (c) Write a program in C++ to demonstrate destructor in inheritance. (d) WAP to demonstrate encapsulation property of OOPs.
Lab 4	(a) Write a program that uses a class where the member functions are defined inside a class. (b) WAP that uses a class where member functions are defined outside a class. (c) WAP that uses a class where member functions are defined inside a class. (d) WAP to demonstrate the use of Static Data members.
Lab 5	(a) WAP to demonstrate the use of Dynamic Constructor. (b) WAP to demonstrate the use of function Template. (c) Illustrate and implement the C++ program to initiate the base constructor from derived class constructor.
Lab 6	(a) Write a C++ program to find the largest and smallest element of an array.
	(b) Create a class Matrix. Implement all possible matrix operations for Matrix type objects by overloading them.
Lab 7	(a) Create 2 classes OM and DB which store the value of distance. DM store distances in meters and cm and DB in feet and inches. Write a program that can read values for the class objects and add 1 object OM with another object of DB.
	(b) Define a class to represent bank account. Include the following members: **Data members** 1. Name of depositor. 2. Account number. 3. Type of account. 4. Balance amount in the account. **Member functions** 1. To assign initial values. 2. To deposit an amount. 3. To withdraw an amount after checking the balance. 4. To display name and balance. Write a main program to test the program.
Lab 8	(a) WAP to demonstrate static class data. (b) WAP to demonstrate the use of Public, Private and protected classes.
Lab 9	(a) WAP to illustrate the concept of call by reference. (b) WAP to illustrate the concept of unary operator overloading. (c) WAP to illustrate the concept of binary operator overloading.
Lab 10	(a) WAP to demonstrate the use of function overloading. (b) WAP using multiple inheritance for collecting employee details.
Lab 11	(a) WAP using function template to find maximum of two Data. (b) WAP to calculate factorial of given number using copy constructor.
Lab 12	(a) WAP to sort five float and integer numbers using template function (use bubble sort). (b) Demonstrate the use of different types of polymorphism.
Lab 13	(a) Write a function to read a matrix of size M × N from keyboard. (b) WAP to implement aggregation concept.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Environmental Science**	Course Code: **BA1010**
Credit: **2**	L **2** T **0** P **0**
Year: **1st**	Semester: **II**

Unit – 1 **(6L)**

Natural Resources: Renewable and non-renewable resources

Definition, scope, importance and need for public awareness, natural resources and associated problems.

- Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
- Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
- Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture and green revolution, water logging, salinity.
- Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources.
- Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Unit – 2 **(5L)**

Ecosystems

Concept, Structure and function of an ecosystem, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the Forest and aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit – 3 **(5L)**

Biodiversity and its conservation

Introduction – Definition: genetic, species and ecosystem diversity. Bio geographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-sports of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit – 4 **(6L)**

Environmental Pollution

Definition, Cause, effects and control measures of:-

a. Air pollution b. Water pollution c. Soil pollution
d. Marine pollution e. Noise pollution f. Thermal pollution
g. Nuclear hazards

• Solid waste Management and biomedical waste: Causes, effects and control
• Role of an individual in prevention of pollution.
• Pollution effects-global warming, acid rain, ozone depletion, smog and case studies.
• Disaster management: floods, earthquake, cyclone and landslides.

Unit – 5 **(6L)**

Social Issues and the Environment

• From Unsustainable to Sustainable development
• Water conservation, rain water harvesting, watershed management
• Environmental Impact Assessment and Resettlement and rehabilitation problems.
• Climate change
• Wetland conservation.
• Role of remote sensing and GIS in environmental monitoring and analysis
• Environment Protection Act. 1986
• Air (Prevention and Control of Pollution) Act. 1981
• Water (Prevention and control of Pollution) Act 1974
• Wildlife Protection Act 1972
• Forest Conservation Act 1980.

Field work:

• Visit to a local area to document environmental assets river/forest/grassland/hill/mountain
• Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
• Study of common plants, insects, birds.
• Study of simple ecosystems-pond, river, hill slopes, etc.

REFERENCE BOOKS:

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad –380 013, India, Email:mapin@icenet.net (R)
2. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
3. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
4. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
5. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
6. Gleick, H.P. 1993. Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
7. Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
8. Mckinney, M.L. & School, R.M. 1996. Environmental Science Systems & Solutions, Web enhanced edition. 639p.
9. AnubhaKaushik&Kaushik, C.P. 2009.Perspectives in Environmental Studies, New Age International Publishers.
10. Manahan. S.E., Environmental chemistry, 9th edition.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Engineering Graphics**	Course Code: **LA1220**
Credit: 1	L **1** T **0** P **0**
Year: **1st**	Semester: **II**

UNIT – 1
Introduction: Sheet Layout, Types of Sheet, Size of Sheets, Title blocks, Type of lines, Lettering, Dimensioning, Scale (Full, Reduced, Large) Geometrical Constructions,

UNIT – 2
Projection: Methods of Projection, Planes of Projection, Projection of points, Projection of straight lines, Projection of auxiliary planes, Projection of planes.

UNIT – 3
Projection of solids, Sections of solids.

UNIT – 4
Development of surfaces

UNIT – 5
Isometric Projections

Reference Books:
1) Bhatt N. D. & Panchal V. M, "Engineering Drawing", Charotar Publisher, 2007.
2) Dhanjay A Jolhe, "Engineering Drawing" Tata McGraw Hill, 2008.
3) Gill P.S "Engineering Graphics" S. K. Kataria & Sons, 2009
4) John K.C, "Engineering Graphics" , 2nd edition, PHI Learning Pvt. Ltd., 2010

List of Experiments

1. Introduction to AutoCAD Commands, Explaining need of AUTO CAD over Manual drafting, Simple Drawings.
2. Sheet on Lettering and Geometric construction.
3. Orthographic Projections, Basic problem based on Projection of points.
4. Sheet on Projection of Lines.
5. Sheet on Projection of Planes.
6. Sheet on Projection of Auxiliary Planes.
7. Sheet on Projection of Solids.
8. Development of Surfaces.
9. Sheet on Isometric Projections from orthogonal views.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Basic Network Analysis**	Course Code: **EA3210**
Credit: 4.5	L **3** T **1** P **2**
Year: **2nd**	Semester: **III**

Unit – 1

Introduction to continuous time signals and systems: Basic continuous time signals, unit step, unit ramp, unit impulse and periodic signals with their mathematical representation and characteristics. Waveform synthesis,

Analogous System: Linear mechanical elements, force-voltage and force-current analogy, modeling of mechanical and electro- mechanical systems

Unit – 2

Graph Theory: Graph of a Network, definitions, tree, co tree , link, basic loop and basic cut set, Incidence matrix, cut set matrix, Tie set matrix Duality, Loop and Node methods of analysis. Analysis of first and second order linear systems by classical method.

Unit – 3

Network Theorems (Applications to ac networks): Super- position theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, Reciprocity theorem. Millman's theorem, compensation theorem, Tellegen's theorem

Unit – 4

Transform methods of Analysis: Exponential form and Trigonometric form of Fourier series, Fourier symmetry, Fourier Integral and Fourier Transform. Transform of common functions and periodic wave forms: Applications of Fourier Transform to network analysis.

Unit – 5

Laplace Transform Analysis: Laplace Transform, Laplace Transform of periodic functions, Initial and Final Value Theorems, Inverse Laplace Transform, Convolution Theorem, Superposition Integral, Application of Laplace Transform to analysis of networks, waveform synthesis and Laplace Transform of complex waveforms.

Text Books

1. William Hayt, Jack Kemmerly, Steven Durbin, "Engineering Circuit Analysis", Tata McGraw Hill , 8th Edition
2. ChoudharyD.Roy, "Network & Systems", Wiley Eastern Ltd.

Reference Books:

1. Kuo, "Network Analysis & Synthesis", Wiley India
2. Jagan, "Network Analysis", B S Publication
3. ME Van-Valkenberg; "Network Analysis", Prentice Hall of India
4. Donald E.Scott, "Introduction to circuit Analysis" Mc. Graw Hill
5. B.P. Lathi, "Linear Systems & Signals" Oxford University Press, 2008.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Electrical Measurement & Measuring Instruments**	Course Code: **EA3220**		
Credit: 4.5	L	T	P
	3	**1**	**2**
Year: **2nd**	Semester: **III**		

UNIT – 1

Philosophy Of Measurement: Methods of Measurement, Measurement System, Classification of instrument system, Characteristics of instruments & measurement system, Errors in measurement & its analysis, Standards.

Analog Measurement of Electrical Quantities: Electrodynamic, Thermocouple, Electrostatic & Rectifier type Ammeters & Voltmeters, Electrodynamic Wattmeter, Three Phase Wattmeter, Power in three phase system, errors & remedies in wattmeter and energy meter.

UNIT – 2

Instrument transformers: Instrument Transformer and their applications in the extension of instrument range, Introduction to measurement of speed, frequency and power factor.

UNIT – 3

Measurement of Parameters: Different methods of measuring low, medium and high resistances, measurement of inductance & capacitance with the help of AC Bridges, Q Meter.

UNIT – 4

AC Potentiometer: Polar type & Co-ordinate type AC potentiometers, application of AC Potentiometers in electrical measurement

Magnetic Measurement: Ballistic Galvanometer, flux meter, determination of hysteresis loop, Measurement of iron losses.

UNIT – 5

Digital Measurement of Electrical Quantities: Concept of digital measurement, block Diagram, Study of digital voltmeter, frequency meter Power Analyzer and Harmonics Analyzer; Electronic Multimeter.

Text Book:

1. E.W. Golding & F.C. Widdis, "Electrical Measurement &Measuring Instrument", A.W. Wheeler & Co. Pvt. Ltd. India.
2. A.K. Sawhney, "Electrical & Electronic Measurement & Instrument", DhanpatRai& Sons, India.

Reference Books:

1. Forest K. Harries, "Electrical Measurement", Willey Eastern Pvt. Ltd. India.
2. M.B. Stout, "Basic Electrical Measurement", Prentice hall of India,India.
3. W.D.Cooper, "Electronic Instrument & Measurement Technique", Prentice Hall International.
4. Rajendra Prashad, "Electrical Measurement &Measuring Instrument", Khanna Publisher.
5. J.B. Gupta, "Electrical Measurements and Measuring Instruments", S.K. Kataria & Sons.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Electro-Mechanical Energy Conversion – I**	Course Code: **EA3230**
Credit: 4.5	L: **3** T: **1** P: **2**
Year: **2nd**	Semester: **III**

UNIT – 1

Principles of Electro-mechanical Energy Conversion:- Introduction, Flow of Energy in Electromechanical Devices, Energy in magnetic systems (defining energy & Co-energy), Singly Excited Systems; determination of mechanical force, mechanical energy, torque equation, Doubly excited Systems; Energy stored in magnetic field, electromagnetic torque Generated emf in machines; torque in machines with cylindrical air gap .

UNIT – 2

D.C. Machines:- Construction of DC Machines, Armature winding, Emf and torque equation Armature Reaction, Commutation, Interpoles and Compensating Windings, Performance Characteristics of D.C. generators.

UNIT –3

D.C. Machines (Contd.):- Performance Characteristics of D.C. motors, Starting of D.C. motors; 3-point and 4-point starters, Speed control of D.C. motors: Field Control, armature control and Voltage Control (Ward Leonard method); Efficiency and Testing of D.C. machines (Hopkinson's and Swinburne's Test).

UNIT –4

Review of Single Phase Transformer: Phasor diagram, efficiency and voltage regulation, all day efficiency, Testing of Transformers: O.C. and S.C. tests, Sumpner's test, polarity test.

Auto Transformer: Single phase and three phase auto transformers, volt-amp relationship, efficiency, merits & demerits and applications.

UNIT –5

Three Phase Transformers: Construction, three phase transformer phasor groups and their connections, open delta connection, three phase to 2 phase, 6 phase or 12 phase connections, and their applications, parallel operation and load sharing of single phase and three phase transformers, excitation phenomenon and harmonics in transformers.

Text Books:

1. P.S.Bhimbra, "Electrical Machinery", Khanna publication India
2. I.J. Nagrath& D.P.Kothari, "Electrical Machines", Tata McGraw Hill

Reference Books:

1. Charles Gross, Electric Machines, T & F, Delhi
2. A.E. Fitzgerald, C.KingsleyJr&Umans, "Electric Machinery", 6th Edition, McGraw Hill International Student Edition
5. Sen, "Principles of Electric Machines and Power Electronics", 2nd edition, Wiley India

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Engineering Mathematics – III**	Course Code: **JA3010**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **2nd**	Semester: **III**

UNIT – 1 **8L**

Complex variable- I

Elementary functions; limit, continuity & differentiability; Analytic Functions; Cauchy – Riemann equations; Harmonic functions; Line integral in the complex plane; Cauchy's Integral theorem; Cauchy's Integral formula for derivatives of analytic function.

UNIT – 2 **6L**

Complex Variables -II

Power series; Taylor's series; Laurent's series; Poles; Zeros; Singularities; Residue Theorem; Evaluation of real integrals of the type $\int_0^{2\pi} f(\cos\theta, \sin\theta)d\theta$ and $\int_{-\infty}^{\infty} f(x)dx$.

UNIT – 3 **8L**

Special Functions

Series solution of ODE of 2nd order with variable coefficient with special emphasis to Legendre and Bessel differential equation by Frobenious method; Legendre polynomial of first kind; Bessel function of first kind and their properties.

UNIT – 4 **8L**

Fourier Transform & Z-transform

Fourier integral; Fourier transform; Fourier sine and cosine transforms; Linearity, Scaling, frequency shifting and time shifting properties; Convolution theorem and its application.
Z – Transform; Properties of Z-transforms; Convolution of two sequences; Inverse Z-transform; Solution of difference equations.

UNIT – 5 **8L**

Partial differential equations and its Applications

Introduction to partial differential equations; Linear partial differential equations with constant coefficients of second order and their classification; Method of Separation of Variables for solving Partial Differential Equations; One-Dimensional Wave Equation; One Dimensional Heat Equation.

Text Books:

1. Brown & Churchill: **Complex Variables & Applications**, 9th edition, McGraw-Hill, 2013.
2. R. K. Jain & S. R. K. Iyenger, **Advanced Engineering Mathematics**, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.

Reference Books:

1. B. S. Grewal, **Higher Engineering Mathematics**, 42th Edition, Khanna publication, New Delhi, India, 2012.
2. E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, John Wiley & Sons, U.K., 2006.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

EA3210: NETWORK LAB

Note: Minimum eight experiments are to be performed from the following list. The department may add 3 to 4 more experiments in the following list.

1. Verification of principle of superposition with dc and ac sources.
2. Verification of Thevenin, Norton and Maximum power transfer theorems in ac circuits
3. Verification of Tellegin's theorem for two networks of the same topology
4. Determination of transient response of current in RL and RC circuits with step voltage input
5. Determination of transient response of current in RLC circuit with step voltage input for underdamp, critically damp and overdamp cases
6. Determination of frequency response of current in RLC circuit with sinusoidal ac input
7. Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values
8. Determination of image impedance and characteristic impedance of T and ∏ networks, using O.C. and S.C. tests Write Demo for the following (in Ms-Power point)
9. Determination of frequency response of a Twin – T notch filter.

EA3220: MEASUREMENT LAB

Note: Minimum eight experiments are to be performed from the following list. The department may add 3 to 4 more experiments in the following list.

1. Calibration of ac voltmeter and ac ammeter
2. Measurement of form factor of a rectified sine wave and determine source of error if r.m.s. value is measured by a multi-meter
3. Measurement of phase difference and frequency of a sinusoidal ac voltage using C.R.O.
4. Measurement of power and power factor of a single phase inductive load and to study effect of capacitance connected across the load on the power factor
5. Measurement of low resistance by Kelvin's double bridge
6. Measurement of voltage, current and resistance using dc potentiometer
7. Measurement of inductance by Maxwell's bridge
8. Measurement of inductance by Hay's bridge
9. Measurement of inductance by Anderson's bridge
10. Measurement of capacitance by Owen's bridge
11. Measurement of capacitance by De Sauty Bridge
12. Measurement of capacitance by Schering Bridge
13. Study of Frequency and differential time counter

EA3230: ELECTROMECHANICAL ENERGY CONVERSION- I LAB

Note: Minimum eight experiments are to be performed from the following list. The department may add 3 to 4 more experiments in the following list.

1. To obtain magnetization characteristics of a d.c. shunt generator.
2. To obtain load characteristics of a d.c. shunt generator and compound generator.
3. To obtain efficiency of a dc shunt machine using Swinburne's test.
4. To perform Hopkinson's test and determine losses and efficiency of DC machine.
5. To obtain speed-torque characteristics of a dc shunt motor.
6. To obtain speed control of dc shunt motor using (a) armature resistance control (b) field control.
7. To obtain speed control of dc separately excited motor using Conventional Ward-Leonard/ StaticWard – Leonard method.
8. To study polarity and ratio test of single phase and 3-phase transformers.
9. To obtain equivalent circuit, efficiency and voltage regulation of a single phase transformer usingO.C. and S.C. tests.
10. To obtain efficiency and voltage regulation of a single phase transformer by Sumpner's test.
11. To obtain 3-phase to 2-phase conversion by Scott connection.
12. To determine excitation phenomenon (B.H. loop) of single phase transformer using C.R.O.
13. To perform parallel operation of single phase transformers.

FA3290: ANALOG & DIGITAL ELECTRONICS LAB

Note: Minimum eight experiments are to be performed from the following list. The department may add 3 to 4 more experiments in the following list.

1. To Plot V-I characteristics of junction diode and zener diode.
2. To draw wave shape of the electrical signal at input and output points of the half wave, full wave and bridge rectifiers.
3. To Plot input / output characteristics for common base transistor.
4. To Plot input /output characteristics of FET and determine FET parameters at a given operating point.
5. To determine voltage gain, current gain, input impedance and output impedance of common emitter amplifier.
6. To determine voltage gain, current gain, input impedance and output impedance and frequency response of R-C coupled common emitter amplifier.
7. To design R-C Phase shift / Wein Bridge oscillator and verify experimentally the frequency of oscillation.
8. To study transistor as a switch and determine load voltage and load current when the transistor is ON.
9. To study application of Operational Amplifier as summer integrator and voltage comparator
10. To study operation of Op-Amp based astable and monostablemultivibrators.
11. To study operation IC 555 based astable and monostablemultibrators.
12. To study operation of (a) multiplexer using IC 74150 (b) demultiplexer using IC 74138.
13. To study operation of Adder / Subtractor
14. To study operation of J K Master – slave flip – flop
15. To verify experimentally output of A/D and D/A converters.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Analog & Digital Electronics**	Course Code: **FA3290**
Credit: 4.5	L: **3** T: **1** P: **2**
Year: **2nd**	Semester: **III**

UNIT – 1
Special Diodes- LED, Varactor diode, Photo diode, Schottky diode, Tunnel diode; their characteristics and applications. Transistors as a switch.

UNIT – 2
Frequency Response: Amplifier transfer function, low and high frequency response of common emitter and common source amplifiers.
Feedback: General feedback structure; properties of negative feedback; series-series, series-shunt, shunt-series and shunt-shunt feedback amplifiers.

UNIT – 3
Basic principle of sinusoidal oscillator, R-C Phase Shift and Wein Bridge oscillators, tuned oscillators- Collpits and Hartley; Crystal oscillator

UNIT – 4
Combinational Logic Circuits: Multiplexers/Demultiplexers, Encoders/Decoders. Sequential Logic Circuits: latches, flip-flops- S-R, T, D, J-K.
Shift Registers: Basic principle, serial and parallel data transfer, shift left/right registers, universal shift register.
Counters: Mode N Counters, ripple counters, synchronous counters, ring/Johnson counters.

UNIT – 5
OP-AMP applications – Astable, Monostable and Bistable multivibrators, Schmitt trigger, IC555 Timer, A/D and D/A converters.
Voltage Regulators: Series, shunt and switching regulators, op-amp based configurations.
Memories: Introduction to ROM, RAM; Sequential Memory, Memory organization.

Text Books:
1. A.S. Sedra and K.C. Smith “Microelectronics Circuits” Oxford University Press (India)
2. Malvino& Leach, “Digital Principles and applications” Tata Mc. Graw Hill
3. R.A. Gayakwad “Op amps and Linear Integrated Circuits” Prentice Hall of India.
4. Balbir Kumar and ShailB.Jain, “Electronic Devices and Circuits” Prentice Hall of India,2007

Reference Books:
1. Taub& Schilling “Digital Electronics”- Tata McGraw Hill
2. Anil K. Maini, “Digital Electronics: Principles and Integrated circuits” Wiley India Ltd, 2008.
3. Millman, J. and Grabel A, “Microelectronics” McGraw Hill
4. Anand Kumar, “Switching Theory and Logic Design” Prentice Hall of India, 2008.
5. Aloke. K. Dutta, “Semiconductor Devices and circuits”, Oxford University Press, 2008.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Hydraulic Machines**	Course Code: **LA30A0**		
Credit: 3	L	T	P
	3	**0**	**0**
Year: **2nd**	Semester: **III**		

UNIT – 1

Thermodynamics: Thermodynamic equilibrium, cyclic process, enthalpy, Zero, first and second laws of thermodynamics, carnot cycle, concept of entropy, properties of steam, processes involving steam in closed and open systems, Enthalpy.

Vapour Pressure Cycles: Rankine cycle, reheat cycle, Regenerative cycle

UNIT – 2

Steam Turbine: Classification, impulse and reaction turbines their velocity diagrams and related calculations, work done and efficiencies, re-heat factor, staging, bleeding and governing of turbines.

Gas Turbine: Classification, Brayton cycle, working principle of gas turbine, gas turbine cycle with intercooling, reheat and regeneration, stage and polytrophic efficiencies.

UNIT – 3

Compressors: Classification, single and multistage reciprocating compressors, isothermal and volumetric efficiencies, centrifugal and axial flow compressors, surging, choking and stalling.

I.C. Engines: Otto, Diesel and Dual cycles, introduction to 2-stroke and 4-stroke SI and CI engines, indicator diagram and power measurement.

UNIT – 4

Hydraulic Turbines: Classification, heads and efficiencies, construction, working, work done and efficiency of impulse and reaction turbines.

Reference Books:

1. P.L. Ballany “Thermal Engineering”, Khanna Publishers, 2003
2. R.K. Bansal “A Text Book of Fluid Mechanics and Hydraulic Machines” Laxmi Publications, 2006.
3. Onkar Singh “Applied Thermodynamics” New Age International, 2006
4. R.K. Rajput “A Text Book of Hydraulic Machines” S. Chand & Co., 2008.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Electromechanical Energy Conversion - II**	Course Code: **EA4210**
Credit: 4.5	L T P **3 1 2**
Year: **2nd**	Semester: **IV**

UNIT – 1

Synchronous Machine–I:

Constructional features, Armature winding, EMF Equation, Winding coefficients, equivalent circuit and phasor diagram, Armature reaction, Working principle of synchronous generator, O. C. & S. C. tests, Voltage Regulation using Synchronous Impedance Method, MMF Method, Potier's Triangle Method, Parallel Operation of synchronous generators, operation on infinite bus, synchronizing power and torque co-efficient

UNIT – 2

Synchronous Machine–II:

Two Reaction Theory, Power flow equations of cylindrical and salient pole machines, Operating characteristics

Synchronous Motor: Working principle of synchronous motor, Starting methods, Effect of varying field current at different loads, V-Curves, Hunting & damping, synchronous condenser.

UNIT – 3

Three phase Induction Machine–I:

Constructional features, Rotating magnetic field, Principle of operation ,Phasor diagram, equivalent circuit, torque and power equations, Torque- slip characteristics, no load & blocked rotor tests, efficiency, Induction generator

UNIT – 4

Three phase Induction Machine-II:

Starting, Deep bar and double cage rotors, Cogging & Crawling, Speed Control (with and without emf injection in rotor circuit.)

UNIT – 5

Single phase Induction Motor:

Double revolving field theory, Equivalent circuit, No load and blocked rotor tests, Starting methods, repulsion motor. AC Commutator Motors: Universal motor, Single phase a.c. series compensated motor, stepper motors

Text Books:

1. Dr.P.S.Bhimbra, "Electrical Machinery ",Khanna Publishers India
2. D.P.Kothari&I.J.Nagrath, "Electric Machines", Tata McGraw Hill

Reference Books:

1. Sen, "Principles of Electrical Machines & Power Electronics", Wiley India
2. O.C. Taylor, "The performance & design of A.C. Commutator Motors", A.H. Wheeler & Co (P) Ltd.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Network Analysis and Synthesis**	Course Code: **EA4220**
Credit: 4.5	L T P **3 1 2**
Year: **2nd**	Semester: **IV**

UNIT 1

Network Functions : Concept of Complex frequency, Transform Impedances Network functions of one port and two port networks, concept of poles and zeros, properties of driving point and transfer functions, time response and stability from pole zero plot.

UNIT 2

Two Port Networks: Characterization of LTI two port networks Z, Y, ABCD, h and g-parameters, reciprocity and symmetry, Inter- relationships between the parameters, inter-connections of two port networks, Ladder and Lattice networks. T & ∏ Representation.

UNIT 3

Network Synthesis : Positive real function; definition and properties; properties of LC, RC and RL driving point functions, synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms.

UNIT 4

Filters: Introduction, Classification of filters, Image parameters and characteristics impedance, passive and active filter, low pass, high pass, constant K type, M derived filters and their design.

UNIT 5

Sampled Data System: Introduction, Spectrum analysis of sampling process, Signal reconstruction, Difference equation, Z- transform, Z-transform function, Inverse Z-transform, Relation of z- and s-transform, Stability analysis, Application of z-transform

Text Books:

1. Kuo, "Network Analysis and Synthesis", 2nd edition, Wiley India.
2. M.E. Van Valkenburg, "Network Analysis", Prentice Hall of India.

Reference Books:

1. N.C. Jagan and C. Lakshminarayana, "Network Analysis & Synthesis", B.S. Publications, 2008.
2. Nagrath and Gopal, "Control System Engineering", Wiley Eastern Ltd.
3. M.E. Van Valkenburg, "An Introduction to Modern Network Synthesis", Wiley Eastern Ltd.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Microprocessor**	Course Code: **EA4230**
Credit: 4.5	L T P **3 1 2**
Year: **2nd**	Semester: **IV**

UNIT – 1

Introduction To Microprocessor: 8085 Evolution Of Microprocessor, Register Structure, ALU, Bus Organization, Timing And Control, Instruction set.

Architecture of 16-bit Microprocessors: Architecture of 8086; (Bus Interface Unit, Execution unit) Register Organization, Bus operation, Memory segmentation.

UNIT – 2

Assembly Language Programming: Addressing Modes and instruction set of 8086, Arithmetic and Logic instructions, Program Control Instructions (jumps, conditional jumps, subroutine call) Loop and string instructions , Assembler Directives.

UNIT – 3

CPU MODULE: Signal Description of pins of 8086 and 8088, Clock generator, Address and Data bus Demultiplexing, Buffering Memory Organization, Read and Write cycle Timings, Interrupt Structures, Minimum Mode, Maximum Mode Operation.

UNIT – 4

Peripheral Interfacing: Programmed I/O, Interrupt Driven, I/O, DMA, Parallel I/O, (8255-PPI, Parallel port), 8253/8254 programmable Timer/Counter Interfacing with ADC.

UNIT – 5

Peripheral Interfacing (Contd.): 8259 Programmable Interrupt controller, 8237 DMA controller, Concept of Advanced 32 bit Microprocessors: Pentium Processor.

Text Book:

1. Ray, A.K. & Burchandi, K.M., "Advanced Microprocessors and Peripherals: Architecture, Programming and Interfacing", Tata McGraw Hill.
2. Hall D.V. , "Microprocessors Interfacing" ,2nd edition, Tata McGraw Hill

Reference Books

1. Gaonkar, Ramesh S., "Microprocessor Architecture, Programming, and Applications with the 8085", Pen Ram International Publishing , 5th edition
2. B.P. Singh &Renu Singh, "Microprocessors and Microcontrollers", New Age International.
3. Liu and Gibson G.A. , "Microcomputer Systems: The 8086/8088 Family", Prentice Hall (India), 2nd edition
4. Brey, Barry B. , "INTEL microprocessors", Prentice Hall (India), 4th edition
5. Ram B., "Advanced Microprocessor & Interfacing" , Tata McGraw Hill
6. Renu Singh & B.P. Singh, "Microprocessors and Interfacing & Applications", New Age International.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Electrical Power Generation**	Course Code: **EA4010**
Credit: 3.5	L T P **3 1 0**
Year: **2nd**	Semester: **IV**

UNIT – 1

Introduction: Electric energy demand and growth in India, electric energy sources.

Thermal Power Plant: Site selection, general layout and operation of plant, detailed description and use of different parts.

Hydro Electric Plants: Classifications, location and site selection, detailed description of various components, general layout and operation of Plants, brief description of impulse, reaction, Kaplan and Francis turbines, advantages & disadvantages, hydro-potential in India

UNIT – 2

Nuclear Power Plant: Location, site selection, general layout and operation of plant. Brief description of different types of reactors Moderator material, fissile materials, control of nuclear reactors, disposal of nuclear waste material, shielding.

Gas Turbine Plant: Operational principle of gas turbine plant & its efficiency, fuels, open and closed-cycle plants, regeneration, inter-cooling and reheating, role and applications.

Diesel Plants: Diesel plant layout, components & their functions, its performance, role and applications

UNIT – 3

Power Plant Economics and Tariffs:

Load curve, load duration curve, different factors related to plants and consumers, Cost of electrical energy, depreciation, generation cost, effect of Load factor on unit cost. Fixed and operating cost of different plants, role of load diversity in power system economy. Objectives and forms of Tariff including three part tariff; Causes and effects of low power factor, advantages of power factor improvement, different methods for power factor improvements

UNIT – 4

Major Electrical Equipment in Power Plants: Alternators for hydro plants, turbo alternators, requirement of excitation systems, types of excitation systems, duties and qualities of automatic voltage regulators, brief description of different types of voltage regulators, earthing of power systems

Cogeneration: Introduction, types of cycles and technologies, advantages and scope in India

Captive Generation: Introduction, advantages and constraints, types of captive power generation, future prospects, energy banking and wheeling.

MHD generation: Working principle, open and closed cycles, MHD systems, advantages, parameters governing power output.

UNIT – 5

Solar power plant: Conversion of solar heat to electricity, Solar energy collectors, Photovoltaic cell, power generation, future prospects of solar energy use.

Wind Energy: Windmills, power output with combined operation of wind turbine generation and isolated generating system, technical choices & economic size.

Introduction to Geothermal energy, Ocean Energy and Tidal energy, Introduction to fuel cells.

Energy Conservation: Principles of energy conservation, energy conservation planning; energy conservation in industries, generation, transmission, distribution, transport, agriculture etc.,

Text Books:

1. B.R. Gupta, "Generation of Electrical Energy", S. Chand Publications

Reference Books:

1. Elements of Electric Power Station Design by M.V. Deshpande
2. A. Chakrabarti, M.L. Soni, P.V. Gupta, U.S. Bhatnagar , "A Text Book on Power System Engineering", Dhanpat Rai & Co
3. J.B.Gupta, "A Course in Electrical Power", Kataria Publications
4. R.K.Rajput, "Power Plant Engineering", Laxmi Publications

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Engineering Materials**	Course Code: **EA4020**
Credit: 3.5	L T P **3 1 0**
Year: **2nd**	Semester: **IV**

UNIT – 1

Crystal Structure of Materials:

Bonds in solids, crystal structure, co-ordination number, atomic radius representation of plane distance b/w two planed packing factor, Miller Indices, Bragg's law and x-ray diffraction, structural Imperfections, crystal growth

UNIT – 2

Electrical Engineering Material:

Electron theory of metals, factors affecting electrical resistance of materials, thermal conductivity of metals, heat developed in current carrying conductors, Half effect, Drift and Diffusion currents, continuity equation, thermoelectric effect, superconductivity and super conducting materials, optical properties of solids

UNIT – 3

Magnetic Material:

Origin of permanent magnetic dipoles in matters, Classification Diamagnetism, Paramagnetism, Ferromagnetism, Antiferromagnetism and Ferrimagnetism, magnetostriction, Properties of magnetic materials, soft and hard magnetic materials, permanent magnetic materials.

UNIT – 4

Dielectric Materials:

Polarization and Dielectric constant, Dielectric constant of mono-atomic, Poly atomic gases and solids, frequency dependence of electronic and ionic polarisabilities, dipolar relaxation, dielectric loss, piezoelectricity, ferroelectric materials

UNIT – 5

Polarization and Dielectric constant, Dielectric constant of mono-atomic, Poly atomic gases and solids, frequency dependence of electronic and ionic polarisabilities, dipolar relaxation, dielectric loss, piezoelectricity, ferroelectric materials

Text Books:

1. A.J. Dekker, "Electrical Engineering Materials", Prentice Hall of India
2. R. K. Rajput, "Electrical Engineering Materials", Laxmi Publications

Reference Books:

1. Solymar, "Electrical Properties of Materials" Oxford University Press.
2. Ian P. Hones, "Material Science for Electrical & Electronic Engineering," Oxford University Press.
3. J.B. Gupta, "Electrical and Electronics Engineering Materials" Katson publishers.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Numerical Techniques** (***Departmental Elective***)	Course Code: **JA4610**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **2nd**	Semester: **IV**

UNIT – 1

Introduction to numerical computing, approximations and errors in numerical computations Truncation and round off errors, propagation of errors. Root finding: Bisection method, Regula-falsi method, iteration method, Newton Raphson method, Rate of convergence of above methods.

UNIT – 2

Matrix algebra, Solution of simultaneous linear algebraic equations: Gauss elimination, Gauss Jordan method, LU Decomposition method, Jacobi method, Gauss Seidel method.

UNIT – 3

Interpolation and Extrapolation: Finite differences, Difference table, Newton's forward and backward interpolation formula. Divided differences and Newton's divided difference formula. Numerical differentiation, Numerical integration: Trapezoidal and Simpson's rules, Weddle's formula.

UNIT – 4

Numerical solution of O.D.E.: Taylor series method, Euler's method, Modified Euler's method, Forth order RungeKutta methods. Multistep methods: Milne's method, Adams Bashforth method.

Text Books:

1. Numerical Method: E. Balagurusamy, Tata McGraw Hill Publication.
2. Applied Numerical Analysis: Curtis F. Gerald and Patrick O. Wheatley – Pearson Education Lt.

Reference Books:

1. Introductory Methods of Numerical Analysis: S.S. Sastry, PHI learning Pvt. Ltd.
2. Numerical Methods for Scientific and Engineering computation: M.K Jain, S.R.K Iyengar and R.K Jain, New age International Publishers.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Operation Research** ***(Departmental Elective)***	Course Code: **LA6040**
Credit: 3.5	L T P **3 1 0**
Year: **2nd**	Semester: **IV**

UNIT – 1 **11L**

Introduction: Linear programming, Definition, scope of Operations Research, approach and limitations. Models, Characteristics and phases of O.R., Mathematical formulation of L.P. Problems. Graphical solution methods.

Linear Programming Problems: The simplex method - slack, surplus and artificial variables. Concept of duality, two phase method, dual simplex method, degeneracy, and procedure for resolving degenerate cases.

UNIT – 2 **11L**

Transportation Problem:

Formulation of transportation model, Basic feasible solution using different methods, Optimality, Methods, Unbalanced transportation problem, Degeneracy in transportation problems, Applications of Transportation problems.

Assignment Problem: Formulation, unbalanced assignment problem, traveling problem.

UNIT – 3 **7L**

Game Theory: Formulation of games, two person-Zero sum game, games with and without saddle point, Graphical solution (2x n, m x 2 game), and dominance property.

UNIT – 4 **7L**

Queuing Theory: Queuing system and their characteristics. The M/M/1 Queuing system, Steady state performance analysis of M/M/ 1 and M/M/C queuing model.

UNIT – 5 **8L**

PERT-CPM Techniques: Network construction, determining critical path, floats, scheduling by network, project duration, variance under probabilistic models, prediction of date of completion, crashing of simple networks.

Reference Books:

1) J.K. Sharma; Operation Research; Theory and application, 5th edition, 2013.
2) A.M. Natrajan, P. Balsubramani, A. Tamil Aravari, Operation Research; 4th edition, 2005.
3) Taha H.A.; Operation Research; Pearson; 8th edition, 2008.
4) Vivek Kumar; Operation Research; Katson Books, 5th edition, 2012.

EA4210: ELECTRO-MECHANICAL ENERGY CONVERSION – II LAB

Note: Minimum eight experiments are to be performed from the following list. The department may add 3 to 4 more experiments in the following list.

1. To perform no load and blocked rotor tests on a three phase squirrel cage induction motor anddetermine equivalent circuit.
2. To perform load test on a three phase induction motor and draw:
   (i) Torque -speed characteristics (ii) Power factor-line current characteristics
3. To perform no load & blocked rotor tests on 1- Ø induction motor and determine equivalent circuit.
4. To study speed control of three phase induction motor by keeping V/f ratio constant
5. To perform O.C. & S.C. tests on a 3-Ø alternator and determine voltage regulation at full load and at unity, 0.8 lagging and leading power factors by (i) EMF method (ii) MMF method.
6. To determine V-curves and inverted V-curves of a three phase synchronous motor.
8. To determine Xd and Xq of a three phase salient pole synchronous machine using the slip test and draw the power-angle curve.
9. To study synchronization of an alternator with the infinite bus by using: (i) dark lamp method (ii) two bright and one dark lamp method

EA4220: SIMULATION LAB

Note: Minimum eight experiments are to be performed from the following list. The department may add 3 to 4 more experiments in the following list.

1. To determine node voltages and branch currents in a resistive network. To obtain Thevenin's equivalent circuit of a resistive network.
2. To obtain transient response of a series R-L-C circuit for step voltage input.
3. To obtain transient response of a parallel R-L-C circuit for step current input.
4. To obtain transient response of a series R-L-C circuit for alternating square voltage waveform.
5. To obtain frequency response of a series R-L-C circuit for sinusoidal voltage input
6. To determine line and load currents in a three phase delta circuit connected to a 3-phase balanced ac supply.
7. To plot magnitude, phase and step response of a network function.
8. To determine Z, Y, G, H and transmission parameters of a two part network.
9. To obtain transient response of output voltage in a single phase half wave rectifier circuit using capacitance filter.

EA4230: MICROPROCESOR LAB

Note: Minimum eight experiments are to be performed from the following list. The department may add 3 to 4 more experiments in the following list.

A. Study Experiments

1. To study 8085 based microprocessor system
2. To study 8086 and 8086A based microprocessor system
3. To study Pentium Processor

B. Programming based Experiments (any four)

4. To develop and run a program for finding out the largest/smallest number from a given set of numbers.
5. To develop and run a program for arranging in ascending/descending order of a set of numbers
6. To perform multiplication/division of given numbers
7. To perform conversion of temperature from ^{0}F to ^{0}C and vice-versa
8. To perform computation of square root of a given number
9. To perform floating point mathematical operations (addition, subtraction, multiplication and division)

B. Interfacing based Experiments (any four)

10. To obtain interfacing of RAM chip to 8085/8086 based system
11. To obtain interfacing of keyboard controller
12. To obtain interfacing of DMA controller
13. To obtain interfacing of PPI
14. To obtain interfacing of UART/USART
15. To perform microprocessor based stepper motor operation through 8085 kit
16. To perform microprocessor based traffic light control
17. To perform microprocessor based temperature control of hot water

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Power Electronics**	Course Code: **EA5210**
Credit: 4.5	L: **3** T: **1** P: **2**
Year: **3rd**	Semester: **V**

UNIT–1

Power semiconductor Devices: Power semiconductor devices their symbols and static characteristics; Characteristics and specifications of switches, types of power electronic circuits. Thyristor – Operation V- I characteristics, two transistor model; Triacs, GTOs, MOSFETs and IGBTs - static characteristics and principles of operation

UNIT–2

Power Semiconductor Devices (Contd): Protection of devices; Series and parallel operation of thyristors; Commutation techniques of thyristor

DC-DC Converters: Principles of step-down and step-up chopper and their operation with R-L load; Classification of choppers.

UNIT–3

Phase Controlled Converters: Single phase half wave controlled rectifier with resistive and inductive loads, effect of freewheeling diode; Single phase fully controlled and half controlled bridge converters; Three phase half wave converters, three phase fully controlled and half controlled bridge converters; Effect of source impedance; Single phase and three phase dual converters.

UNIT–4

AC Voltage Controllers: Principle of On-Off and phase controls; Single phase ac voltage controller with resistive and inductive loads; Three phase ac voltage controllers (various configurations and comparison)

Cyclo Converters: Basic principle of operation, single phase to single phase, three phase to single phase and three phase to three phase cyclo converters, output voltage equation.

UNIT–5

Inverters: Single phase series resonant inverter; Single phase bridge inverters

Three phase bridge inverters: 120°and 180° mode of operation; Voltage control of inverters; Harmonics reduction techniques; Single phase and three phase current source inverters.

Text Books:

1. M.H. Rashid, "Power Electronics: Circuits, Devices & Applications", Prentice Hall of India Ltd. 3rd Edition, 2004.
2. P.S.Bimbhra, "Power Electronics" Khanna Publication.
3. Umanand "Power Electronics" Wiley India.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Control System**	Course Code: **EA5220**
Credit: 4.5	L T P **3 1 2**
Year: **3rd**	Semester: **V**

UNIT – 1
The Control System: Open loop & closed control; servomechanism, Physical examples.Transfer functions, Block diagram algebra, Signal flow graph, Mason's gain formula Reduction of parameter variation and effects of disturbance by using negative feedback

UNIT – 2
Time Response analysis: Standard test signals, time response of first and second order systems, time response specifications, steady state errors and error constants.
Controllers: Introduction to P, PI, & PID controller. performance indices

UNIT – 3
Control System Components: Constructional and working concept of ac servomotor, synchros and stepper motor.
Concept of Stability: Routh-Hurwitz criteria, Root Locus Technique

UNIT – 4
Frequency response Analysis: Frequency response, correlation between time and frequency responses, polar and inverse polar plots, Bode plots: gain margin and phase margin.
Stability in Frequency Domain: Nyquist stability criterion, relative stability.

UNIT – 5
Introduction to Design: The design problem and preliminary considerations lead, lag and lead-lag networks, design of closed loop systems using compensation techniques in time domain and frequency domain.

Text Book:
1. I.J. Nagrath&Gopal, "Control System Engineering", 4th Edition, New age International.
2. K. Ogata, "Modern Control Engineering", Prentice Hall of India.

Reference Books:
1. Norman S. Nise, Control System Engineering 4th edition, Wiley Publishing Co.
2. M.Gopal, "Control System; Principle and design", Tata McGraw Hill.
3. M.Gopal," Modern Control system", Tata McGraw Hill.
4. D.RoyChoudhary, "Modern Control Engineering", Prentice Hall of India.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Elements of Power System**	Course Code: **EA5010**
Credit: 3.5	L T P **3 1 0**
Year: **3rd**	Semester: **V**

UNIT – 1

Power System Components

Single line diagram of Power System, Supply system, Different types of supply system and their comparison, Transmission line configurations, Types of conductors, Skin effect, Kelvin's law, Proximity effect.

UNIT – 2

Over Head Transmission Lines

Calculation of inductance and capacitance of single phase, three phase, single circuit, and double circuit transmission lines. Representation of short, medium and long transmission lines, Ferranti effect, Surge impedance loading

UNIT – 3

Corona and Line Insulators

Corona formation, calculation of potential gradient, corona loss, factors affecting corona, Methods of reducing corona and interference. Electrostatic and electromagnetic interference with communication lines. Types of insulators and their application, Potential distribution over a string of insulators, Methods of equalizing the potential, String efficiency

UNIT – 4

Mechanical Design of Transmission Lines

Catenary curve, Calculation of sag & tension, Effects of wind and ice loading, Sag template, Vibration dampers, Types of towers and their design

UNIT – 5

Insulated Cables

Types of cables and their construction , Dielectric stress, Grading of cables, Insulation resistance, Capacitance of single phase and three phase cables, Dielectric losses, Heating of cables.

Text Books

1. W.D. Stevenson, "Element of Power System Analysis", McGraw Hill, USA
2. C.L. Wadhwa, "Electrical Power Systems", New Age International Ltd., Third Edition
3. Ashfaq Husain, "Power System", CBS Publishers & Distributors, India
4. B.R. Gupta, "Power System Analysis & Design", S.Chand& Co, Third Edition
5. M.V. Deshpande, " Electrical Power System Design", Tata McGraw Hill

Reference Books

1. Soni, Gupta &Bhatnagar, "A Course in Electrical Power", DhanpatRai& Sons, India
2. S.L. Uppal, " Electric Power", Khanna Publishers
3. S.N. Singh, "Electric Power Generation, Transmission & Distribution", PHI, New Delhi

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Fundamentals of EM Theory**	Course Code: **EA5020**
Credit: 3.5	L T P **3 1 0**
Year: **3rd**	Semester: **V**

UNIT 1: **6L**

COORDINATE SYSTEMS AND TRANSFORMATION

Cartesian Coordinates, Circular Cylindrical Coordinates, Spherical Coordinates Vector Calculus: Differential Length, Area and Volume, Line Surface and Volume Integrals, Del Operator, Gradient of a Scalar, Divergence of a Vector and Divergence Theorem, Curl of a Vector and Stoke's Theorem, Laplacian of a Scalar.

UNIT 2: **8L**

ELECTROMAGNETIC WAVE PROPAGATION

Faraday's Law, Transformer and Motional Electromotive Forces, Displacement Current, Derivation of Maxwell's Equations For Static and Time-Varying Fields. Differential and integral forms, concept of displacement current, Boundary conditions.

UNIT 3: **8L**

ELECTROMAGNETIC WAVE PROPAGATION APPLICATIONS

Electromagnetic Wave Propagation: Wave Propagation in Lossy Dielectrics, Plane Waves in Lossless Dielectrics, Plane Wave in Free Space, Plain Waves in Good Conductors, Power and The Poynting Vector, Reflection of a Plane Wave in a Normal incidence.

UNIT 4: **8L**

TRANSMISSION LINES

Transmission Lines: Transmission Line Parameters, Transmission Line Equations, Input Impedance, Standing Wave Ratio and Power, Smith Chart, Some Applications of Transmission Lines. Time & Frequency Domain analysis of Transmission lines, Low loss RF and UHF transmission lines, Distortion-less condition, Transmission line charts- impedance matching.

UNIT 5: **8L**

WAVE GUIDES

Wave Guides: Introduction to Planar (Rectangular) Waveguides, Derivation of TE and TM Modes, TEM Mode. Circular Waveguides-Derivation of TE and TM Modes, TEM Mode. Impedance and characteristics impedances. Transmission line analogy for wave guides. Attenuation and factor of wave guides. Dielectrics lab waveguides, Resonators

Text Books:

1. Elements of Electromagnetics, MN OSadiku, 2012.

Reference Books:

1. Engineering Electromagnetic, William Hayt, McGraw-Hill, 2011.
2. Electromagnetic Fields, K. D. Parsad, 2010.
3. Electromagnetic waves and radiating systems. Edward Conrad *Jordan*, Keith George *Balmain*. Prentice-Hall, 1996.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Engineering Economics**	Course Code: **GC5010**
Credit: 2	L T P **2 0 0**
Year: **3rd**	Semester: **V**

UNIT – 1

Time value of money: Simple and compound interest, Time value equivalence, Compound interest factors, Cash flow diagrams, Calculation, Calculation of time –value equivalences. Present worth comparisons, Comparisons of assets with equal, unequal and infinite lives, comparison of deferred investments, Future worth comparison, payback period comparison.

UNIT – 2

Use and situations for equivalent annual worth comparison, Comparison of assets of equal and unequal life. Rate of return, Internal rate of return, comparison of IIR with other methods, IRR misconceptions.

UNIT – 3

Analysis of public Projects: Benefit/ Cost analysis, quantification of project, cost and benefits, benefit/ cost applications, Cost –effectiveness analysis.

UNIT – 4

Depreciation, computing depreciation charges, after tax economic comparison, Break-even analysis; linear and non-linear models. Product and Process Costing, Standard Costing, cost estimation, Relevant Cost for decision making, Cost control and Cost reduction techniques.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Data Structure**	Course Code: **DA3210**
Credit: 4	L T P **3 0 2**
Year: **3rd**	Semester: **V**

UNIT 1 ***(8L)***

Introduction: Concept of data structure, Types of data structures, Character String in C, Recursion, Structure, Pointer, Dynamic Allocation, Algorithms, Algorithm analysis, Complexity of algorithms and Time space trade-off.

Arrays: Introduction, Single and multi-Dimensional Arrays, address calculation, application of arrays, Operations defined: traversal, insertion and deletion.

Stacks: Stacks, Array representation of stack, Applications of stacks, Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack.

UNIT 2 ***(8L)***

Queue: Queue, Array representation and implementation of queues, Circular queues, Operations on Queue: Create Add, Delete, and Full and Empty, De-Queue, Priority queues, Applications of Queues.

Linked Lists: Concept of linked list, Representation and implementation of singly linked list, Circular linked list, doubly linked list, Operations on Linked lists, Concepts of header linked lists, applications of linked lists.

UNIT 3 ***(8L)***

Trees: Basic terminologies of trees, Binary tree, Complete Binary tree, Extended Binary tree, Representation of Binary tree, Binary tree traversal, Operations on Binary tree.

Binary Search Tree: Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, B-trees.

UNIT 4 ***(6L)***

Graphs: Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Representations of Graphs, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.

UNIT 5 ***(10L)***

Searching &**Hashing:** linear search, binary search, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.

Sorting: Bubble sort, Insertion sort, Selection sort, Quick sort, Merge sort, Heap Sort.

File Handling: Introduction to file handling, Data and Information, File concepts, File organization, files and streams, working with files.

Text Books:

1. "Data Structures" Schaum's Outline Series,Lipschutz, TMH.
2. Data Structures using C by A. M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub.

Reference Books:

1. "Fundamentals of Data Structures", Horowitz and Sahani, Galgotia Publication.
2. Data Structures and Program Design in C By Robert Kruse, PHI.
3. Data Structure and the Standard Template library – Willam J. Collins, 2003, T.M.H.

EA5210: POWER ELECTRONICS LAB

Note: Minimum eight experiments are to be performed from the following list. The department may add 3 to 4 more experiments in the following list.

1. To study V-I characteristics of SCR and measure latching and holding currents.
2. To study UJT trigger circuit for half wave and full wave control.
3. To study single-phase half wave controlled rectified with (i) resistive load (ii) inductive load with and without freewheeling diode.
4. To study single phase (i) fully controlled (ii) half controlled bridge rectifiers with resistive and inductive loads.
5. To study three-phase fully/half controlled bridge rectifier with resistive and inductive loads.
6. To study single-phase ac voltage regulator with resistive and inductive loads.
7. To study single phase cyclo-converter
8. To study triggering of (i) IGBT (ii) MOSFET (iii) power transistor
9. To study operation of IGBT/MOSFET chopper circuit
10. To study MOSFET/IGBT based single-phase series-resonant inverter.
11. To study MOSFET/IGBT based single-phase bridge inverter.

Software based experiments (PSPICE/MATLAB)

12. To obtain simulation of SCR and GTO thyristor.
13. To obtain simulation of Power Transistor and IGBT.
15. To obtain simulation of single phase full wave ac voltage controller and draw load voltage and load current waveforms for inductive load.

EA5220: CONTROL SYSTEM LAB

Note: Minimum eight experiments are to be performed from the following list. The department may add 3 to 4 more experiments in the following list.

1. To determine response of first order and second order systems for step input for various values of constant 'K' using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller for an oven and compare their performance.
3. To study and calibrate temperature using resistance temperature detector (RTD)
4. To design Lag, Lead and Lag-Lead compensators using Bode plot.
5. To study DC position control system
6. To study synchro-transmitter and receiver and obtain output V/S input characteristics
7. To determine speed-torque characteristics of an ac servomotor.
8. To study performance of servo voltage stabilizer at various loads using load bank.
9. To study behaviour of separately excited dc motor in open loop and closed loop conditions at various loads.
10. To study PID Controller for simulation proves like transportation lag.

Software based experiments (Use MATLAB, LABVIEW software etc.)

11. To determine time domain response of a second order system for step input and obtain performance parameters.
12. To convert transfer function of a system into state space form and vice-versa.
13. To plot root locus diagram of an open loop transfer function & determine range of gain 'k' for stability.
14. To plot a Bode diagram of an open loop transfer function.
15. To draw a Nyquist plot of an open loop transfer functions and examine the stability of the closed loop system.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Switch Gear and Protection**	Course Code: **EA6210**		
Credit: 4.5	L	T	P
	3	**1**	**2**
Year: **3rd**	Semester: **VI**		

UNIT I
Protective Relays
Basic principles, types, Construction and characteristics of electromagnetic relays, Elements of static relays, Comparators, Basic principle of digital relays, Overcurrent , Earth fault and differential relays.

UNIT II
Protection Schemes
Protection of generators, transformers, transmission line, busbar and motors

UNIT III
Arc Interruption Theories
Formation and extinction of arc, properties of the arc, Restriking and recovery voltage, Methods and control devices for arc extinction, Current chopping, Resistance switching

UNIT IV
Circuit Breakers
Oil circuit breaker, Air blast circuit breaker, SF_6 circuit breaker, Vacuum circuit breaker, Circuit breaker duties and ratings, Testing and maintenance of circuit breakers, HRC and other types of fuse, Isolators

UNIT V
Power System Transients
Overvoltage in the transmission lines, Fault clearance, Lightning and switching surges, Transmission, refraction and attenuation of surges. Ground wire, Sphere gaps, Lightning arrestors, BIL and insulation coordination, Grounding of power system.

Text Books

1. Switchgear and protection Sunil S. Rao, Khanna Publishers
2. Power System Engg. Soni Gupta &Bhatnagar, DhanpatRai& Sons
3. A course in Electrical Power, C.L. Wadhawa, New Age International
4. Power system protection and switchgear, B. Ram, Wiley Eastern Ltd.

Reference Books

1. Power system protection & switchgear, Badriram& D.V. Vishwakarma, TMH
2. Switchgear & Protection, M.V. Deshpande, TMH

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Instrumentation and Process Control**	Course Code: **EA6220**
Credit: 4.5	L: **3** T: **1** P: **2**
Year: **3rd**	Semester: **VI**

UNIT – 1
Transducer – I
Definition, advantages of electrical transducers, classification, characteristics, factors affecting the choice of transducers, Potentiometers, Strain guages, Resistance thermometer, Thermistors, Thermocouples, LVDT, RVDT

UNIT – 2
Transducer – II
Capacitive, Piezoelectric Hall effect and opto electronic transducers. Measurement of Motion, Force pressure, temperature, flow and liquid level.

UNIT – 3
Telemetry
General telemetry system, land line & radio frequency telemetering system, transmission channels and media, receiver & transmitter. Data Acquisition System: Analog data acquisition system, Digital data acquisition system, Modern digital data acquisition system.

UNIT – 4
Display Devices and Recorders
Display devices, storage oscilloscope, spectrum analyzer, strip chart & x-y recorders, magnetic tape & digital tape recorders.
Recent Developments: Computer aided measurements, fibre optic transducers, microsessors, smart sensors, smart transmitters.

UNIT – 5
Process Control
Principle, elements of process control system, process characteristics, proportional (P), integral (I), Derivative (D), PI, PD and PID control modes. Electronic, Pneumatic & digital controllers.

Text Books:
1. A.K.Sawhney, "Advanced Measurements & Instrumentation", DhanpatRai& Sons
2. B.C. Nakra&K.Chaudhry, "Instrumentation, Measurement and Analysis", Tata McGraw Hill 2nd Edition.
3. Curtis Johns, "Process Control Instrumentation Technology", Prentice Hall

Reference Books:
4. E.O. Decblin, "Measurement System – Application & design", McGraw Hill.
5. W.D. Cooper and A.P. Beltried, "Electronics Instrumentation and Measurement Techniques", Prentice Hall International
6. RajendraPrasad, "Electronic Measurement and Instrumentation Khanna Publisher
7. M.M.S. Anand, "Electronic Instruments and Instrumentation Technology" PHI Learning.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Power System Analysis**	Course Code: **EA6010**
Credit: 3.5	L T P **3 1 0**
Year: **3rd**	Semester: **VI**

UNIT – 1

Introduction

Representation of power system components like synchronous machine, transformer, transmission line. One line diagram, Impedance and Reactance diagram, per unit system of calculation, Brief description of power system components like synchronous machine, transformer, busbar, transmission line and isolators.

UNIT – 2

Load Flow Analysis

Bus classifications, Formation of bus admittance matrix by singular transformation, Formation of load flow problem, Gauss – Siedel and Newton – Raphson method of load flow analysis, Approximation of Newton – Raphson load flow analysis, Fast decoupled method.

UNIT – 3

Fault Analysis

Types of fault – shunt and series, Calculation of fault current and voltages for symmetrical short circuit, Symmetrical components, Sequence impedance, Unsymmetrical short circuits, Open conductor fault, Current limiting reactors

UNIT – 4

Stability Analysis

Introduction to steady state and transient Stability of power systems, Swing equation, Equal area criteria, Solution of swing equation, Methods of improving stability

UNIT – 5

Distribution System & Substations

Different types of distribution systems, Distribution from one and both ends, Ring mains, Unbalanced loading, 3 phase 4 wire and 3 phase 5 wire distribution system, Layout of distribution substation, Rural electrification and grounding.

Text Books

1. W.D. Stevenson, "Element of Power System Analysis", McGraw Hill, USA
2. C.L. Wadhwa, "Electrical Power Systems", New Age International Ltd., Third Edition
3. Ashfaq Husain, "Power System", CBS Publishers & Distributors, India
4. B.R. Gupta, "Power System Analysis & Design", S.Chand& Co, Third Edition
5. M.V. Deshpande, " Electrical Power System Design", Tata McGraw Hill

Reference Books

1. Soni, Gupta &Bhatnagar, "A Course in Electrical Power", DhanpatRai& Sons, India
2. S.L. Uppal, " Electric Power", Khanna Publishers
3. S.N. Singh, "Electric Power Generation, Transmission & Distribution", PHI, New Delhi

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Modern Control System**	Course Code: **EA6020**
Credit: 3.5	L T P **3 1 0**
Year: **3rd**	Semester: **VI**

UNIT – 1

Discrete Data Systems: Introduction to discrete time systems, sample and hold circuits, pulse transfer function, representation by differential equations and its solution using z-transform and inverse-z transforms, analysis of LTI systems, unit circle concepts.

UNIT – 2

State Space analysis

State equations for dynamic systems, State equations using phase, physical and canonical variables, realization of transfer matrices, Solution of state equation, concepts of controllability, observability, Controllability and Observability tests.

UNIT – 3

Non-linear System & Linearization: Introduction to non-linear system and their state variable representation. Linearization, describing function of various non-linearities. Stability analysis using describing function.

UNIT – 4

Stability: Liapunov's method, generation of Liapunov's function, Popov's criteria, design of state observers and controllers, adaptive control systems, model reference.

UNIT – 5

Optimal Control: Introduction , formation of optimal control problems, calculus of variation, minimization of functions, constrained optimization, dynamic programming, performance index , optimality principles, Hamilton – Jacobian equation, linear quadratic problem, Ricatti II equation and its solution, solution of two point boundary value problem

Text Books:

1. K. Ogata, "Modern Control Engineering", Prentice Hall of India.
2. M. Gopal, "Modern Control System", Wiley Eastern.
3. Stefani, Shahain, Savant, Hostetter, "Design of feedback control system", oxford university press.

Reference Books:

1. B.D.O. Anderson and IB. Moore, " Optimal Control System: Linear Quadratic Methods", Prenctice Hall International.
2. U. Itkis, "Control System of Variable Structure", John Wiley and Sons.
3. H. Kwakemaok and R. Sivan, "Linear Optimal Control System", Wiley Interscience.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Principles of Communication Engineering**	Course Code: **FA63E0**
Credit: 3.5	L T P **3 1 0**
Year: **3rd**	Semester: **VI**

UNIT – 1

Amplitude Modulation: Amplitude modulation, DSBSC, SSB and VSB modulation and demodulation schemes, AM transmitters and receivers, super-heterodyne receiver, IF amplifiers, AGC circuits. Frequency division multiplexing.

UNIT – 2

Angle Modulation: Frequency modulation, phase modulation, Generation of frequency modulation FM receivers and demodulators

Noise: External noise, internal noise, Noise calculations, signal to noise ratio, Noise in AM and FM systems

UNIT – 3

Pulse Communication: Sampling Process, PAM, PWM, PPM and PCM, Delta modulation and adaptive delta modulation

Digital Modulation: Introduction, brief description of phase shift keying(PSK), Differential phase shift keying (DPSK), frequency shift Keying (FSK), Quadrature amplitude modulation (QAM) and time division multiplexing (TDM).

UNIT – 4

Radio Propagation: Ground waves, sky wave propagation, space waves, tropospheric scatter propagation,

Satellite Communication: transponders, Geo-stationary satellite system, low earth and medium earth-orbit satellite system. Introduction to Cellular system. Personal communication system (PCS), data communication with PCS.

UNIT – 5

Television: TV systems and standards, scanning and synchronizing, common video and sound circuits, vertical and horizontal deflections, colour transmission and reception.

Fibre Optical Communication Optical fibre and fibre cables, fibre characteristics and classification, fibre optic components and systems.

Text Books :

1. G. Kennedy and B. Davis , “Electronic Communication Systems” Tata McGraw Hill
2. Simon Haykin, “ Communication Systems” John Wiley & Sons

Reference Books :

1. Roy Blake, “ Wireless Communication Technology” Thomson Asia Pvt. Ltd. Singapore
2. B. P. Lathi, “Modern Analog and Digital Communication Systems” Oxford University Press.
3. Taub& Schilling, “Principles of Communication Systems” McGraw Hill.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Principles of Management**	Course Code: **HA5010**
Credit: 2	L T P **2 0 0**
Year: **3rd**	Semester: **VI**

UNIT – 1 **5L**

Overview of management: Definition of management, need for management, role of managers, Management as science and art, evolution of management thought, contribution of Taylor and Fayol, Types of business organizations, Levels of management

UNIT – 2 **9L**

Planning: Definition of planning, steps involved in planning, types of planning, objectives, process of managing by objectives, Strategy, types of strategies, Policy, types of policies, Decision making, types of decision making process.

UNIT – 3 **10L**

Organizing: Nature, purpose and structure of organization, formal and informal organization, Departmentation, its importance, basis of departmentation, Line and staff authority, Centralization and decentralization, Authority and responsibility, delegation of authority
Selection and recruitment, orientation, appraisal, HRD.

UNIT – 4 **8L**

Directing: Creativity and innovation, Motivation, hierarachy of needs, motivation theories, Leadership – definition, elements, styles, leadership theories
Organization culture, elements and types of culture, managing cultural diversity.

UNIT – 5 **8L**

Controlling: System and process of controlling, requirements of effective control, Types of control, cost control, purchase control, maintenance control, quality control, planning operations
Globalization and liberalization.

Reference Books:

1. Charles W. L. Hill and Steven McShane, "Principles of Management", McGraw Hill Education, Special Indian edition, 2007.
2. R. N. Gupta, "Principles of Management ", S Chand Limited, 2007.
3. P. C. Tripathy and P. N. Reddy, " Principles and Practices of Management", Tata McGraw Hill, 1999
4. Joseph L. Massie, "Essentials of Management" , Prentice Hall of India, 2003.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

EA6010: POWER SYSTEM LAB

Note: - At least 8 experiments should be performed out of which 3 should be simulation based. The department may add 3 to 4 more experiments in the following list.

(A) Hardware Based:

1. To determine direct axis reactance (xd) and quadrature axis reactance (xq) of a salient pole alternator.
2. To determine negative and zero sequence reactances of an alternator.
3. To determine sub transient direct axis reactance (xd) and sub transient quadrature axis reactance (xq) of an alternator
4. To determine fault current for L-G, L-L, L-L-G and L-L-L faults at the terminals of an alternator at very low excitation
5. To study the IDMT over current relay and determine the time current characteristics
6. To study percentage differential relay
7. To study Impedance, MHO and Reactance type distance relays
8. To determine location of fault in a cable using cable fault locator
9. To study ferranty effect and voltage distribution in H.V. long transmission line using transmission line model.
10. To study operation of oil testing set.

Simulation Based Experiments (using MATLAB or any other software)

11. To determine transmission line performance.
12. To obtain steady state, transient and sub-transient short circuit currents in an alternator
13. To obtain formation of Y-bus and perform load flow analysis
14. To perform symmetrical fault analysis in a power system
15. To perform unsymmetrical fault analysis in a power system

EA6220: INSTRUMENTATION LAB

Note: Minimum eight experiments are to be performed from the following list. The department may add 3 to 4 more experiments in the following list.

1. Measurement of displacement using LVDT.
2. Measurement of displacement using strain gauge based displacement transducer.
3. Measurement of displacement using magnetic pickup.
4. Measurement of load using strain gauge based load cell.
5. Measurement of water level using strain gauge based water level transducer
6. Measurement of flow rate by anemometer
7. Measurement of temperature by RTD
8. Measurement of temperature by thermocouple
9. Study of P, PI and PID controllers
10. Study of storage oscilloscope and determination of transient response of RLC circuit.
11. Determination of characteristics of a solid state sensor/fibre-optic sensor
12. Design and test a signal conditioning circuit for any transducer
13. Study of data acquisition system using “lab view” software and test all signal points
14. Measurement of sine, triangular,square wave signal of function generator and verify its frequency at 100 Hz tap point using “labview” software.
15. Measurement of voltage and current signal of programmable power supply using Lab view GPIB interface

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Electric Drives**	Course Code: **EA7210**
Credit: 4.5	L: **3** T: **1** P: **2**
Year: **4th**	Semester: **VII**

UNIT – 1

Fundamentals of Electric Drive: Electric Drives and its parts, advantages of electric drives, classification of electric drives; Speed-torque conventions and multi-quadrant operations; Types of load, Load torque: components, nature and classification

Dynamics of Electric Drive: Dynamics of motor-load combination; Steady state stability of Electric Drive; Load equalization.

UNIT – 2

Selection of Motor Power rating: Thermal model of motor for heating and cooling, classes of motor duty, determination of motor power rating for continuous duty, short time duty and intermittent duty.

UNIT – 3

Electric Braking: Purpose and types of electric braking, braking of dc, three phase induction and synchronous motors

Dynamics During Starting and Braking: Calculation of acceleration time and energy loss during starting of dc shunt and three phaseinduction motors, methods of reducing energy loss during starting; Energy relations during braking, dynamics during braking

Special Drives: Switched Reluctance motor,.

UNIT – 4

Power Electronic Control of DC Drives: Single phase and three phase controlled converter fed separately excited dc motor drives (continuous conduction only); dual converter fed separately excited dc motor drive; rectifier control of dc series motor; Chopper control of separately excited dc motor and dc series motor.

UNIT – 5

Power Electronic Control of AC Drives:

Three Phase Induction Motor Drive: Static Voltage control scheme, static frequency control scheme (VSI, CSI, and cyclo – converterbased) static rotor resistance and slip power recovery control schemes.

Text Books:

1. G.K. Dubey, “Fundamentals of Electric Drives”, Narosa publishing House.
2. V.Subrahmanyam, “Electric Drives: Concepts and Applications”, Tata McGraw Hill.

Reference Books:

1. M.Chilkin, “Electric Drives”,Mir Publishers, Moscow.
2. Mohammed A. El-Sharkawi, “Fundamentals of Electric Drives”, Thomson Asia Pvt. Ltd. ,Singapore.
3. N.K. De and Prashant K.Sen, “Electric Drives”, Prentice Hall of India Ltd.
4. S.K.Pillai, “A First Course on Electric Drives”, New Age International.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Artificial Neural Network and Fuzzy Logic**	Course Code: **EA7010**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VII**

UNIT – 1

Neural Networks-1(Introduction & Architecture): Neuron, biological neuron, Artificial Neuron and its model, activation functions, Neural network architecture: Single layer and multilayer feed forward networks, recurrent networks, and various learning techniques.

UNIT – 2

Back propagation networks Architecture: perceptron model, single layer artificial neural networks, multilayer perceptron model; back propagation algorithm, effects of learning coefficient; factors affecting back propagation training, applications.

UNIT – 3

Fuzzy logic-I (Introduction): Basic concept of fuzzy, Fuzzy sets and crisp sets, Fuzzy sets theory and operations, Properties of fuzzy sets. Fuzzy and crisp relation.

UNIT – 4

Fuzzy Membership Functions, Rules: Membership functions, inference in fuzzy logic, fuzzy if then rules, fuzzifications & defuzzifications, fuzzy controller.

UNIT – 5

Application of Neural and fuzzy logic: Application of neural network, Neural Network approach in load flow study. Fuzzy logic application in industries.

Text Books:

1. S. Rajasekaran and G.A.V.Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI

Reference Books:

1. Simon Haykins, ”Neural Networks” Prentice Hall of India
2. Moore, “Digital control devices”, ISA press, 1986.
3. Kumar Satish, “Neural Networks”, Tata McGraw Hill
4. Timothy J Ross, “Fuzzy Logic with Engineering Applications”, McGraw Hill 1997

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Power System Operation and Control**	Course Code: **EA7020**
Credit: 3.5	L T P **3 1 0**
Year: **4th**	Semester: **VII**

UNIT 1

Introduction: Structure of power system, power system control center,level decomposition in power system, power system security, various operational stages of power system, power system voltage stability, introduction to SCADA

UNIT 2

Economic Operation: Concept and problems of unit commitment, input output characteristics of thermal and hydroplants, system constraints, Optimal operation of thermal units without and with transmission losses, penalty factor, incremental transmission loss, transmission loss , formula (without derivation), hydrothermal scheduling long and short terms, concept of optimal power flow

UNIT 3

Load Frequency Control: Concept of load frequency control, load frequency control of signal area system: turbine speed governing system and modeling, block diagram representation of single area system, steady state analysis, dynamic response control area concept, P-I control, load frequency
Control and economic dispatch control. Load frequency control of two area system tie line power modeling, block diagram representation of two area system,

UNIT 5

Automatic Voltage Control: Schematic diagram and block diagram representation, Different type of excitation system & their controllers. Concept of voltage control, methods of voltage control, control by tap changing transformer. Shunt compensation, series compensation, phase angle compensation

UNIT 6

Fact Devices

Concept and objectives of FACTS controllers, Introduction to different FACT controllers like TCR, FC-TCR, TSC, SVC, STATCOM, TSSC, TCSC, SSSC, TC-PAR, UPFC

Text Books:

1. D.P. Kothari & I.J. Nagrath, "Modern Power System Analysis" Tata McGraw Hill, 3rd edition.
2. P.S.R. Murty, "Operation and Control in Power Systems" B.S. publications

Reference Books:

1. N.G. Hingorani& l. Gyugyi, "Understanding Facts “Concepts and Technology of Flexible AC Transmission Systems", IEEE Press Publications
2. A.J. Wood & B.F. Wollenburg, "Power Generation, Operation and Control ", John Wiley & Sons
3. O.J. Elgerd,"Electric Energy System Theory”, Tata McGraw Hill.
4. P. Kundur, "Power System Stability and Control”, McGraw Hill.
5. M.H. Rashid, "Power Electronics: Circuits, Devices and Applications "Prentice Hall of India”, 3rd edition.
6. T.K. Nagsarkar& M.S. Sukhiza, “Power System Analysis”, Oxford University Press

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Electrical Machine Design**	Course Code: **EA7030**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VII**

UNIT 1

Introduction

Standards & standardization, Classification of insulating materials. Modes of heat dissipation & temperature rise-time curves. Methods of cooling ventilation (induced & forced, radial & axial), direct cooling & quantity of cooling medium.

UNIT 2

Design of Transformer

Output equation design of core, yoke and windings, overall dimensions, Computation of no load current to voltage regulation, efficiency and cooling system designs.

UNIT 3

Design of Synchronous Machines

Output equations of synchronous machines, specific electric and magnetic loadings, separation of main dimensions, Rotor design, Design of field system. Estimation of performance from design data.
Flow chart for design of three phase synchronous generators.

UNIT 4

Design of Induction Machines

Output equations , specific electric and magnetic loadings, factors affecting size of rotating machines, separation of main dimensions, selection of frame size, Rotor design of three phase induction motors. Circle diagram, Estimation of performance from design data. Flow chart for design of three phase induction motors

UNIT 5

Design of DC Machines & Computer Aided Design

Output equation, Main dimensions, Design of armature, commutator, flow chart for design of dc machines.
Philosophy of computer aided design, advantages and limitations. Computer aided design approaches analysis- , synthesis and hybrid methods.

Text Books:

1. A.K. Sawhney, "Electrical Machine Design", DhanpatRai& Sons.
2. S. K. Sen, "Principles of Electrical Machine Design with Computer Programmes", Oxford & IBH Pub. Company

Reference Books

1. M.G. Say, "Alternating Current Machines", Pitman Publishing Company Ltd.
2.A.E. Clayton, "The Performance and Design of DC Machines", Pitman Publishing Company Ltd.
3. H. Cotton, "Advanced Electrical Technology" Wheeler Publishing.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

EA7210: ELECTRIC DRIVES LAB

Note: - At least 8 experiments should be performed out of which 3 should be simulation based. The department may add 3 to 4 more experiments in the following list.

Hardware Based Experiments:

1. To study speed control of separately excited dc motor by varying armature voltage using single-phase fully controlled bridge convertor.
2. To study speed control of separately excited dc motor by varying armature voltage using single-phase half controlled bridge convertor.
3. To study speed control of separately excited dc motor using single-phase dual converter (Static Ward-Leonard Control)
4. To study speed control of separately excited dc motor using MOSFET/IGBT chopper.
5. To study closed loop control of separately excited dc motor.
6. To study speed control of single-phase induction motor using single-phase ac voltage controller.
7. To study speed control of three-phase induction motor using three-phase ac voltage controller.
8. To study speed control of three-phase induction motor using three-phase current source inverter.
9. To study speed control of three-phase induction motor using three-phase voltage source inverter.
10. To study speed control of three-phase slip ring induction motor using static rotor resistance control using rectifier and chopper.
11. To study speed control of three-phase slip ring induction motor using static scherbius slip power recovery control scheme.

Simulation Based Experiments (using MATLAB or any other software)

1. To study starting transient response of separately excited dc motor.
2. To study speed control of separately excited dc motor using single phase fully/half controlled bridge converter in discontinuous and continuous current modes.
3. To study speed control of separately excited dc motor using chopper control in motoring and braking modes.
4. To study starting transient response of three phase induction motor.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **High Voltage Engineering (*Departmental Elective–I*)**	Course Code: **EA7610**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VII**

UNIT – 1

Break Down In Gases: Ionization processes, Townsend's criterion, breakdown in electronegative gases, time lags for breakdown, streamer theory, Paschen's law, breakdown in non- uniform field, breakdown in vacuum.

Break Down In Liquid Dielectrics: Classification of liquid dielectric, characteristics of liquid dielectric, breakdown in pure liquid and commercial liquid.

Break Down In Solid Dielectric: Intrinsic breakdown, electromechanical breakdown, breakdown of solid, dielectric in practice, breakdown in composite dielectrics.

UNIT – 2

Generation of High Voltage and Currents: Generation of High direct Current Voltage, Generation of high voltage alternating voltages, generation of impulse voltages generation of impulse currents, tripping and control of impulse generators.

UNIT – 3

Measurement of High Voltage and Currents: Measurement of High direct Current Voltages, Measurement of High alternating & Impulse voltages, Measurement of High direct, alternating & Impulse Currents, Cathode ray Oscillographs for impulse voltage and current measurements.

UNIT – 4

Over Voltage Phenomenon & insulation Coordination: Lighting Phenomenon as natural cause for over voltage, over voltage due to switching surges and abnormal conditions, Principal of insulation coordination.

UNIT – 5

Non -Destructive Testing: Measurement of direct current resistively, measurement of dielectric constant and loss factor, partial discharge measurements.

High voltage testing: Testing of insulator & bushing, testing of isolators and circuit breakers, testing of cables, testing of transformers, testing of surge arresters, radio interference measurements.

Text Book:

1. M.S. Naidu & V. Kamraju," High voltage Engineering, Tata Mc-Graw hill.

Reference books:

1. E Kuffel and W.S.Zacngal , High voltage Engineering:, Pergamum Press
2. M.P Churasia, High Voltage Engineering Khanna Publishers.
3. R.S. Jha,"High voltage Engineering", DhanpatRai& Sons.
4. C.L. Wadhwa,"High Voltage Engineering", Wiley Eastern Ltd.
5. M.Khalifa," High Voltage Engineering theory and practice, "Marcel Dekker.
6. Subir Ray." An Introduction to High Voltage Engineering" Prentice Hall of India.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **FACTS Devices** (***Departmental Elective–I***)	Course Code: **EA7620**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VII**

UNIT – 1
FACTS: Concept, power flow and stability, basic theory of line compensation
Power Electronic Controllers: Review of PWM voltage source inverters used in FACTS, classifications of FACTS controllers.

UNIT – 2
Static Shunt Compensators: SVC and STATCOM- TCR, TSC, system stability.
Static Series Compensators: GCSC, TSSC, TCSC and SSSC, control techniques.

UNIT – 3
Static Voltage and Phase Angle Regulators: Power flow control, TCVR and TCPAR.
Unified Power Flow Controller (UPFC): Concept of power flow control, operation and control of UPFC, Interline Power Flow Controller.

UNIT – 4
Stability Analysis: Modeling of FACTS devices, optimization of FACTS, transient and dynamic stability enhancement

UNIT – 5
Applications of FACTS controller: Principle of control of FACTS in HVDC links, co- ordination of FACTS devices with HVDC links, case study. Advanced FACTS devices.

Text Books:

1. Hingorani N.G. and Gyugyi L., "Understanding FACTS", IEEE Press, Standard Publishers Distributors.
2. Ghosh A. and Ledwich G., "Power Quality Enhancement Using Custom Power Devices," Kluwer Academic Publishers.

Reference Books:

1. Song Y. H. and Johns A. T., "Flexible AC Transmission Systems (FACTS)", IEE Press.
2. Mathur R.M. and Varma R.K., "Thyristor–Based FACTS Controllers for Electrical Transmission Systems," John Wiley and Sons.
3. Padiyar K.R., "FACTS Controller in Power Transmission and Distribution", New Age International Private Limited.
4. Miller T.J.E., "Reactive Power Control in Electric Systems," Wiley-Interscience.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Power Converter Applications** (***Departmental Elective–I***)	Course Code: **EA7630**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VII**

UNIT – 1
HVDC Transmission:
Schematic diagram, modes of operation, twelve pulse line commutated converters, effect of source [59]inductance, control of HVDC converters, converter faults and protection, harmonic filters.

UNIT – 2
FACT Controllers:
Principle of power transmission, principles of shunt compensation and series compensation; Shunt compensators-TCR, TSC, SVC,STATCOM
Series compensators-TSSC, FCSC, TCSC, SSVC; Phase angle compensator, Unified power flow controller (UPFC), comparison of compensators.

UNIT – 3
Power Supplies:
Desirable specifications of power supplies, drawbacks of linear power supply.
Switch-Mode Power supply (SMPS)-schematic diagram, flyback converter, forward converter, push-pull converter, half bridge and full bridge converters; Uninterruptible power supply (UPS)-configurations of offline and on-line UPS, switch mode and resonant power supplies; air-craft power supply.

UNIT – 4
Industrial Applications:
High frequency inverters for induction and dielectric heating, ac voltage controllers for resistance heating and illumination control, high frequency fluorescent lighting, electric welding control.

UNIT – 5
Interconnection of Renewable Energy Sources to the Utility Grid:
Photovoltaic array interconnection, wind and small hydro interconnection, interconnection of energy storage systems; DC circuit breaker, single phase and three phase ac switches; Excitation control of synchronous generators.

Text Books:
1. Ned Mohan, T.M. Undeland and William P. Robins, "Power Electronics: Converters, Applications and Design", John Wiley & Sons.
2. M.H. Rashid, "Power Electronics: Circuits, Devices and Applications" Prentice Hall of India.

Reference Books:
1. K.R. Padiyar, "HVDC Power Transmission: Technology and System Reactions" New Age International

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Bio Instrumentation (*Departmental Elective–I*)**	Course Code: **EA7640**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VII**

UNIT – 1

Basic Physiological system of body: Problem encountering measuring leaving system, bioelectric potential, biomaterial, Basic transducers principle, Active and passive transducers, transducer for biomedical applications, Generation, propagation and distribution of bioelectric potential (ECG, EEG and EMG)

UNIT – 2

Bio Potential Electrode: Basic type (micro skin surface and needle electrodes), Biochemical transducer (PH, blood gas and specification electrodes), Cardiovascular System & Measurement, Heat and cardiovascular system and circulation block diagram blood pressure and, measurement, characteristics of blood flow and heart sound, Electrocardiography, ECG an lead, configuration, ECG recording and their types

UNIT – 3

Nervous System: The anatomy of nervous system, neuronal communication, EPSP, IPSP, Organization of brain, Measurement from the nervous system, Systematic skin and body temperature measurement, Temperature measurement, Brief idea about ultrasonic measurements

UNIT – 4

Patient Care Monitoring: Element of intensive care, Organizational the hospital for patient-care monitoring, Pace makers-type, systems, mode and generators, Defibrillator-types. Biotelemetry and application of telemeter inpatient care

UNIT – 5

Automation of Chemical Test: Instrumentation for diagnostic X rays, Interfacing computer with medical instrumentation and other equipments, Bio medical computer application. Shock hazards from electrical equipments, methods of accident prevention.

Text Books:

1. Khandpur R.S. - Biomedical Instrumentation- TMH
2. Venkata Ram, S.K.-Bio-Medical Electronics & Instrumentation (Revised) - Galgotia.

Reference Books:

1. Cromwell- Biomedical Instrumentation and Measurements- PHI
2. Webster, J.G. –Bio- Instrumentation, Wiley (2004)
3. Ananthi, S. –A Text Book of Medical Instruments-2005-New Age International
4. Carr & Brown –Introduction to Biomedical Equipment Technology – Pearson
5. Pandey & Kumar-Biomedical Electronics and Instrumentation. - Kataria

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Telemetry and Data Transmission** ***(Departmental Elective)***		Course Code: **EA8620**
Credit: 3.5	L **3**	T **1**	P **0**
Year: **4th**		Semester: **VIII**

UNIT – 1

Sampling Fundamentals: Introduction to sampling theorem and sampling process, convolution, computing minimum sampling rate. Alising Errors.

Digital Modulation Techniques: Review of PCM, DPCM, Methods of binary data transmission, Data Formats, DM code converters, PSK, QPSK, FSK, probability of error, phase ambiguity resolution and differential encoding, error detection, error correction, error correction codes.

UNIT – 2 & 3

Data Handling System: Block schematic, Sensors, Signal conditioners, Multiplexing- high level and low level, ADC- range and resolution, Word Format, Frame format, Frame synchronizer codes, R. F. links, X24, RS 422, RS423, RS 232C interfaces, Multi terminal configuration, Multiplier & Concentrator, Data Modems, Data transmission over telephone lines.

Data Reception Systems: Bit synchronizers, frame synchronizers, subframe synchronizers, PLL, Display systems.

UNIT – 4

Remote Control: Communication based processing control systems, pipelines, Operational security systems components, Pipeline control, Power system control, Programmable controllers for factory automation.

Command: Tone command system, Tone digital command system, ON/OFF command and data commands.

UNIT – 5

Aerospace Telemetry: Signal formation and conversion, Multiplexing techniques in telecontrol, Industrial telecontrol installations, reliability in telecontrol installations.

Text Books:

1. Patranabis, “Telemetry Principles”, Tata McGraw Hill.
2. Schweber, “Data Communication”, McGraw Hill.
3. Berder&Menjewlse, “Telemetry Systems”.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Non-Conventional Energy Resources** *(Departmental Elective)*		Course Code: **EA8630**
Credit: 3.5	L **3**	T **1**	P **0**
Year: **4th**		Semester: **VIII**

UNIT – 1

Introduction Various non-conventional energy resources: Introduction, availability, classification, relative merits and demerits, present energy scenario.

UNIT – 2

Solar Cells: Theory of solar cells. Solar cell materials, solar cell power plant, limitations. Solar Thermal Energy Solar radiation flat plate collectors and their materials, applications and performance, focusing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

UNIT – 3

Geothermal Energy: Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations.
Magneto-hydrodynamics (MHD) Principle of working of MHD Power plant, performance and limitations.

UNIT – 4

Fuel Cells: Principle of working of various types of fuel cells and their working, performance and limitations. Thermo-electrical and thermionic conversions, Principle of working, performance and limitations.
Wind Energy: Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. Performance and limitations of energy conversion systems.

UNIT – 5

Bio-mass: Availability of bio-mass and its conversion theory.
Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations.
Wave and Tidal Wave: Principle of working, performance and limitations. Waste Recycling Plants

Text Books:

1. D.S. Chauhan, “Non-Conventional Energy Resources”, New Age International
2. B.H. Khan, “Non-Conventional Energy Resources”, Tata McGraw Hill

Reference Books:

1. AndraGabdel, "A Handbook for Engineers and Economists".
2. Mani, "Handbook of Solar radiation Data for India".
3. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.
4. F.R. the MITTRE, "Wind Machines" by Energy Resources and Environmental Series.
5. Frank Kreith, "Solar Energy Hand Book".
6. N. Chermisinogg and Thomes, C. Regin, "Principles and Application of Solar Energy".
7. N.G. Calvert, “Wind Power Principles”.
8. W. Palz., P. Chartier and D.O. Hall," Energy from Biomass".

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Special Electrical Machines** ***(Departmental Elective)***	Course Code: **EA8640**
Credit: 3.5	L T P **3 1 0**
Year: **4th**	Semester: **VIII**

UNIT – 1

Poly-phase AC Machines: Construction and performance of double cage and deep bar three phase induction motors; e.m.f. injection in rotor circuit of slip ring induction motor, concept of constant torque and constant power controls, static slip power recovery control schemes (constant torque and constant power), Introduction to multiphase machines.

UNIT – 2

Single phase Induction Motors: Construction, starting characteristics and applications of split phase, capacitor start, capacitor run, capacitor start, capacitor-run and shaded pole motors.

Two Phase AC Servomotors: Construction, torque-speed characteristics, performance and applications.

UNIT – 3

Stepper Motors: Principle of operation, variable reluctance, permanent magnet and hybrid stepper motors, characteristics, drive circuits and applications.

Switched Reluctance Motors: Construction; principle of operation; torque production, modes of operation, drive circuits.

UNIT – 4

Permanent Magnet Machines: Types of permanent magnets and their magnetization characteristics, demagnetizing effect, permanent magnet dc motors, sinusoidal PM ac motors, brushless dc motors and their important features and applications, PCB motors. Single phase synchronous motor; construction, operating principle and characteristics of reluctance and hysteresis motors; introduction to permanent magnet generators.

UNIT – 5

Single Phase Commutator Motors: Construction, principle of operation, characteristics of universal and repulsion motors; Linear Induction Motors. Construction, principle of operation, Linear force, and applications.

Text Books:

1. P.S. Bimbhra "Generalized Theory of Electrical Machines" Khanna Publishers.
2. P.C. Sen "Principles of Electrical Machines and Power Electronics" John willey& Sons, 2001

Reference Books:

1. G.K.Dubey "Fundamentals of Electric Drives" Narosa Publishing House, 2001
2. Cyril G. Veinott "Fractional and Sub-fractional horse power electric motors" McGraw Hill International, 1987
3. M.G. Say "Alternating current Machines" ,Pitman & Sons

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Utilization of Electrical Energy & Traction** *(Departmental Elective)*		Course Code: **EA8670**
Credit: 3.5	L **3**	T **1**	P **0**
Year: **4th**		Semester: **VIII**

UNIT – 1
Electric Heating: Advantage & methods of electric heating, Resistance heating, Electric arc heating, Induction heating, Dielectric heating,

UNIT – 2
Electric Welding: Electric arc welding, electric resistance welding, Electric Welding control, Electrolyte Process: Principal of Electro deposition, laws of Electrolysis, application Electrolysis.

UNIT – 3
Illumination: Various definition, laws of Illumination, requirement of good lighting, Design of indoor lighting & outdoor lighting system.
Refrigeration and Air Conditioning: Refrigeration system, domestic Refrigerator, water cooler, Types of Air conditioning, Window air conditioner

UNIT – 4
Electric Traction – I: Types of electric traction, system of track electrification, Traction mechanics-types of services, speed time curve and its simplification, average and schedule speeds, Tractive effort specific energy consumption, mechanics of train movement, coefficient of adhesion and its influence

UNIT – 5
Electric Traction – II: Salient features of traction drives, Series-parallel control of dc traction drives (bridge traction) and energy saving, Power Electronic control of dc & ac traction drives, Diesel electric traction.

Text books:

1. H. Pratab. "Art & Science of Electric Energy's" Dhanpat Rai & Sons.
2. G.K. Dubey," Fundamentals of Electric Drives" Narosa Publishing house.

Reference Book:

1. H.Pratab, "Modern electric traction" DhanpatRai& Sons.
2. C.L. Wadhwa, "Generation, Distribution and Utilization of Electrical Energy "New Age International Publishers.

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Power Quality** *(Departmental Elective)*	Course Code: **EA8650**
Credit: 3.5	L T P **3 1 0**
Year: **4th**	Semester: **VIII**

UNIT – 1

Power Quality Terms and Definitions: Introduction, transients, sag and swell, short duration/long duration voltage variations, voltage imbalance, waveform distortion, voltage fluctuations, power frequency variation.

Power Quality Problems: Poor load power factor, loads containing harmonics, notching in load voltage, DC offset in loads, unbalanced loads, disturbance in supply voltage.

UNIT – 2

Fundamentals of Harmonics: Representation of harmonics, waveform, harmonic power, measures of harmonic distortion; current and voltage limits of harmonic distortion: IEEE, IEC, EN, NORSOK

Causes of Harmonics: 2-pulse, 6-pulse and 12-pulse converter configurations, input current waveforms and their harmonic spectrum; Input supply harmonics of AC regulator, integral cycle control, cycloconverter, transformer, rotating machines, ARC furnace, TV and battery charger.

UNIT – 3

Effect of Harmonics: Parallel and series resonance, effect of harmonics on static power plant- transmission lines, transformers, capacitor banks, rotating machines, harmonic interference with ripple control systems, power system protection, consumer equipments and communication systems, power measurement.

UNIT – 4

Elimination/Suppression of Harmonics: High power factor converter, multi-pulse converters using transformer connections (Delta, polygon)

Passive Filters: Types of passive filters, single tuned and high pass filters, filer design criteria, double tuned filters, damped filters and their design.

UNIT – 5

Active Power filters: Compensation principle, classification of active filters by objective, systems configuration, power circuit and control strategy.

Shunt Active Filter: Single phase active filter, principle of operation, expression for compensating current, concept of constant capacitor voltage control; Three phase active filter: Operation, analysis and modeling; Instantaneous reactive power theory

Three phase series active filters: Principle of operation, analysis and modeling.

Other Techniques: Unified power quality conditioner, voltage source and current configurations, principle of operation for sag, swell and flicker control.

Text Books:

1. Roger. C. Dugan, Mark. F. McGranagham, Surya Santoso, H.WayneBeaty, ‘Electrical Power Systems Quality’ McGraw Hill, 2003. (For Chapters1,2,3, 4 and 5)

Reference Books:

2. G.T. Heydt, 'Electric Power Quality', 2nd Edition. (West Lafayette, IN, Stars in a Circle Publications, 1994). (For Chapter 1, 2, 3 and 5)
3. M.H.J Bollen, ‘Understanding Power Quality Problems: Voltage Sags and Interruptions’, (New York: IEEE Press, 1999). (For Chapters 1, 2, 3 and 5)
4. J. Arrillaga, N.R. Watson, S. Chen, 'Power System Quality Assessment', (NewYork: Wiley, 1999). (For Chapters 1, 2, 3, 4 and 5)
5. PSCAD User Manual

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **Switch Mode and Resonant Converters** *(Departmental Elective)*	Course Code: **EA8660**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VIII**

UNIT – 1

Introduction: Linear power supply regulators and their drawbacks; switch mode power regulators-elements, salient features and application. Switch-Mode DC-DC Regulators, Without Isolation: Characteristics and analysis of Buck, Boost, BuckBoost, Cuk and Full bridge converters, Multiple output and Diode rectifier–fed Boost converters.

Unit – 2

Switching Power DC Supplies: Overview of Switch-mode dc power supply (SMPS), Introduction to dc-dc converters and their control. Characteristics and analysis of Flyback, Forward, Push-pull, Half bridge, Full bridge and Current source converters, control circuits; Design considerations

UNIT – 3

Switch-Mode DC-AC Inverters (DC to Sinusoidal AC): Basic concepts, single phase full bridge inverter (PWM with unipolar and bipolar voltage switching) and push-pull inverters, three phase PWM inverters other switching schemes. Power conditioners and Uninterruptible Power Supplies (UPS): Disturbances in commercial power supply, power quality and power conditioners, configurations of off-line and on-line UPS, various inverter arrangements, control, batteries.

UNIT – 4

Resonant Converters – I: Concept, advantage and limitations characteristics and analysis of series, parallel, series-parallel, resonant converters, quasi resonant converters, class E resonant inverter, class E rectifier.

UNIT – 5

Resonant Converters-II: ZCS resonant converters (L and M types), and ZVS resonant converters and their comparison Two quadrant ZVS resonant converters, resonant dc link inverters. Utility interface with Power Electronic Systems: Harmonic standards and recommended practices need for improved utility interface, improved single phase utility interface, Electromagnetic interference

Text Books:

1. M.H. Rashid, "Power Electronics: Circuits, Devices and Applications" Prentice hall of India, 3rd Edition
2. Ned Mohan, T.M. Undeland and William P. Robins, "Power Electronics: Converters, Applications and Design" John Willey & Sons, 2nd Edition

Reference Books:

1. M.S. Jamil Asghar, "Power Electronics" Prentice Hall of India
2. R.P. Severns and G.E. Bloom, "Modern DC to DC Switch-Mode Power Converter Circuits" Van Nostrand Reinhold
3. K.Kit Sum, "Switch-Mode Power conversion. Basic Theory and Design" Marcel Decker.
4. G. Chryssis, "High Frequency Switching Power supplies: Theory and Design" McGraw Hill

Department of Electrical Engineering
Course Structure for B.Tech. (EE)
Batch: 2016-20

Course Title: **EHV A.C. and D.C. Transmission** *(Departmental Elective)*		Course Code: **EA8610**
Credit: 3.5	L **3**	T **1** P **0**
Year: **4th**		Semester: **VIII**

UNIT – 1

Introduction: Need of EHV transmission, standard transmission voltage, comparison of EHV AC & DC transmission systems and their applications & limitations, surface voltage gradients in conductor, distribution of voltage gradients on sub-conductors, mechanical considerations of transmission lines, modern trends in EHV AC & DC transmission, Types of tower

UNIT – 2

EHV AC Transmission: Corona loss formulas, corona current, audible noise- generation and characteristics corona pulses their generation and properties, radio interference (RI) effects, over voltage due to switching, ferro-resonance, reduction of switching surges on EHV system.

UNIT – 3

Extra High Voltage Testing: Characteristics and generation of impulse voltage, generation of high AC and DC voltages, measurement of high voltage by sphere gaps and potential dividers. Consideration for Design of EHV Lines, Design factors under steady state limits, EHV line insulation design based upon transient over voltages. Effects of pollution on performance of EHV lines.

UNIT – 4

EHV DC Transmission-I: Types of dc links, converter station, choice of converter configuration and pulse number, effect of source inductance on operation of converters, principle of dc link control, converter controls characteristics, firing angle control, current and excitation angle control, power control, starting and stopping of dc link.

UNIT – 5

EHV DC Transmission- II: Converter faults, protection against over currents and over voltage, HVDC Circuit breakers, Smoothing reactors, generation of harmonics, ac and dc filters, multi –terminal dc systems (MTDC): Types, control, protection and application.

Text Books:

1. R.D. Begamudre, "Extra High Voltage AC Transmission Engineering "Wiley Eastern
2. K.R Padiyar, "HVDC power transmission System, Technology and System Reactions "New Age International.

Reference Books:

1. M.HRashid,"Power Electronics: Circuit, Devices and Applications", Prentice hall of India.
2. S .Rao, "EHV AC & HVDC Transmission Engineering and practice", Khanna Publishers
3. J Arrillaga,"High Voltage Direct current Transmission", IFFE Power Engineering Series 6, Peter Peregrionus Ltd. London.
4. M.S Naidu & V.K Kamaraju "High Voltage Engineering", Tata McGraw Hill.

DIT UNIVERSITY
Dehradun

Course Structure & Detailed Syllabus

of

B. Tech. in Information Technology

Batch 2016-20

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Year: 1st **Semester: I**

Course Code	Course Title	L	T	P	Credit
JA1010	Engineering Mathematics-I	3	1	0	3.5
BA1210	Engineering Chemistry	3	1	2	4.5
EA1210	Introduction to Electrical Engineering	3	1	2	4.5
FA1210	Introduction to Electronics & Communication	3	1	2	4.5
HA1210	Professional Communication-I	3	1	0	3.5
DA1210	Computer Fundamental & C Programming	3	0	2	4
LA1110	Workshop Practice	0	0	2	1
	Total				**25.5**

Year: 1st **Semester: II**

Course Code	Course Title	L	T	P	Credit
JA2010	Engineering Mathematics-II	3	1	0	3.5
OA1210	Engineering Physics	3	1	2	4.5
LA1210	Essentials of Mechanical Engineering	3	1	2	4.5
HA2210	Professional Communication-II	3	0	1	3.5
DA2210	Computer Programming in C++	3	0	2	4
BA1010	Environmental Science	2	0	0	2
LA1220	Engineering Graphics	1	0	0	1
HA1310	Soft Skills Development	0	0	2	1
	Total				**24**

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Year: 2nd **Semester: III**

Course Code	Course Title	L	T	P	Credit
DA3010	Discrete Mathematics	3	1	0	3.5
DA3020	Computer Organization	3	1	0	3.5
DA3210	Data Structures	3	0	2	4
DA3220	Computer based Numerical and Statistical Techniques	3	0	2	4
DA3230	Programming with Java	3	0	2	4
FA3221	Digital System Design	3	1	2	4.5
	Total				**23.5**

Year: 2nd **Semester: IV**

Course Code	Course Title	L	T	P	Credit
DA4010	Theory of Computation	3	1	0	3.5
DA4020	Operating System	3	1	0	3.5
DA4210	Computer Networks	3	0	2	4
DA4220	Web Technology	3	0	2	4
DA4230	Database Management Systems	3	0	2	4
DA4242	Linux Administration & Shell Programming	3	0	2	4
IA4310	Value Addition Training	0	0	2	1
IA4410	Industrial Tour*	0	0	2	1
	Total				**25**

**** The evaluation of the Industrial Tour will be done in the Lab through presentations, viva etc.***

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Year: 3rd **Semester: V**

Course Code	Course Title	L	T	P	Credit
JA5010	Probability and Random Variable	3	1	0	3.5
IA5010	Multimedia Technologies	3	1	0	3.5
DA5230	Artificial Intelligence	3	0	2	4
HA5010	Principles of Management	2	0	0	2
IA5310	Aptitude Building-I	0	0	2	2
DA5210	Algorithms: Analysis & Design	3	0	2	4
DA5220	Advanced Java Programming	3	0	2	4
	Total				**23**

Year: 3rd **Semester: VI**

Course Code	Course Title	L	T	P	Credit
DA6010	Software Engineering	3	0	0	3
DA6020	Data Warehousing & Data Mining	3	1	0	3.5
IA6020	Introduction to System Software	3	0	0	3
GC5010	Engineering Economics	2	0	0	2
IA6310	Aptitude Building-II	2	0	0	2
DA6210	Computer Graphics	3	0	2	4
DA6220	Dot Net Technologies	3	0	2	4
IA6110	Project Phase -I	0	0	4	2
	Total				**23.5**

After VI semester student will undergo minimum 6 weeks Industrial Training which will be evaluated in the VII semester.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Year: 4th **Semester: VII**

Course Code	Course Title	L	T	P	Credit
IA7211	Cloud Computing	3	0	2	4
IA7220	Advance Web Technology	3	0	2	4
DA8010	Business Intelligence	3	1	0	3.5
	Elective-I	3	0	0	3
DA7210	Cryptography & Network Security	3	0	2	4
IA7510	Industrial Training Presentation	0	0	2	4
IA7110	Project Phase II	0	0	4	2
	Total				**24.5**

* **During Summer Vacation after VI semester, students are compulsorily required to attend Industrial training of 6-8 weeks. The same shall be evaluated in VII semester under industrial training presentation (IA7510)**

List of Elective-I for VII semester

Course Code	Course Title
DA6640	Mobile Computing
IA7630	E-Business Application
IA7640	Introduction to Big Data

Year: 4th **Semester: VIII**

Course Code	Course Title	L	T	P	Credit
	Elective – II	3	1	0	3.5
	Elective – III	3	1	0	3.5
	Elective – IV	3	1	0	3.5
	Open Elective	3	1	0	3
IA8120	Project Phase III	0	0	8	4
IA8130	Seminar	0	0	2	1
	Total				**18.5**

List of Elective –II

Course Code	Course Title
DA8020	Soft Computing
IA8620	Service Oriented Computing
IA8630	Introduction to Remote Sensing & GIS

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

List of Elective –III

Course Code	Course Title
IA8640	Ethical Hacking
IA8651	Cyber Crime and Computer Forensics
IA8660	Pattern Recognition

List of Elective –IV

Course Code	Course Title
IA8670	Knowledge Management
IA8680	Software Project Management
IA8690	Information and Coding Theory

List of Open Electives (To be conducted in VIII Semester)

Sl. No.	Branch	Subject Code	Name of Elective subjects
1	Physics	OA8710 OA8720	1. Nano Scale Science and Technology 2. Photonics Technology
2	EE	EA8710 EA8720	1. Non-Conventional Energy Resources 2. Instrumentation and Process control
3	ME	LA8710 LA8720	1. Entrepreneurship development 2. Quality Management
4	Civil	CA8710 CA8720	1. Environment and Ecology 2. GIS
5	CSE	**DA8740** DA8710	1. Management Information System (MIS) 2. Business Intelligence
6	IT	IA8730 IA8721	1. Internet of Things 2. IT In Business
7	ECE	FA8710	1. Consumer Electronics
8	Humanities	HA8710 HA8720	1. Industrial Psychology 2. Human Values and Ethics
9	MBA	GA8710 GA8730 GA8740	1. Organizational Behavior 2. Digital Marketing 3. Financial Modeling with Spread sheet

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Engineering Mathematics-I**			Course Code: **JA1010**
Credit: **3.5**	L **3**	T **1**	P **0**
Year: **1st**			Semester: **I**

UNIT I: Differential Calculus-I [**9**]

Functions of single variable: Limit continuity and differentiability; Indeterminate forms; Mean value theorems; Role's Theorem; Taylor's theorem with remainders; Curve tracing.

UNIT II: Differential Calculus-II [**9**]

Successive differentiation; Leibnitz theorem; Partial differentiation; Euler's theorem; Expansion of functions of several variables; Extrema of functions of several variables; Lagrange's method of multipliers.

UNIT III: Integral Calculus [**9**]

Improper integral-Beta and Gamma functions; Double and Triple integrals; change of order of integration; change of variables; Dirichlet's integral and its applications; Application of multiple integral.

UNIT IV: Vector Calculus [**12**]

Vector Differentiation: Scalar and vector fields; gradient of scalar point function; directional derivatives; divergence and curl of vector point function; solenoidal and irrotational vectors.

Vector Integration: line, surface and volume integrals; Green's theorem; Stokes' theorem and Gauss divergence theorem (without proof).

Text Books:

- R. K. Jain & S. R. K. Iyenger, **Advanced Engineering Mathematics**, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.

Reference Books:

- E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, John &Wiley Sons, U.K., 2006.
- B. S. Grewal, **Higher Engineering Mathematics**, 42th Edition, Khanna publication, New Delhi, India, 2012.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Engineering Chemistry**	Course Code: **BA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **I**

UNIT – I

Water Chemistry

Introduction, Analysis of Water – Alkalinity, Chlorides and Dissolved Oxygen, Hardness of Water - Temporary and Permanent hardness, Estimation of hardness by EDTA Method, Disadvantages of Hard Water, Numerical problems.

Water for Industrial purpose – Boiler Feed Water, Boiler Troubles (Priming and Foaming, Boiler Corrosion, Scales and Sludges, Caustic Embrittlement), Water Treatment: Internal Treatment (Colloidal, Phosphate, Calgon, Carbonate Conditioning), External Treatment (Lime-Soda Process, Zeolite Process, Ion- Exchange Process), Numerical Problems.

UNIT – II

Physical Chemistry

Electrochemistry: Reference electrodes, Ion selective electrodes, Chemically modified electrodes as sensors, Electrochemical energy systems, Lithium batteries, Fuel cells.

Thermochemistry: Hess's Law, Heat of a reaction, Effect of temperature on heat of reaction at constant pressure (Kirchoff's eq.), Heat of dilution, Heat of hydration, Heat of neutralization and Heat of combustion.

Surface chemistry: Surface and interfacial tension, Capillary pressure.Adsorption phenonmenon, Adsorption of gaseson solids, Frendlich and Langmuir adsorption isotherms,Role of adsorbents in catalysis, ion-exchange and pollution abatement.

UNIT – III

Science of Corrosion and Protective Coatings

Introduction, Types of Corrosion, Theories of Corrosion and Mechanism, Factors Influencing Corrosion.Control of Corrosion.

Types of Protective Coatings: Metallic Coatings, Anodic Coatings, Galvanization, Cathodic Coatings, Tinning, Metal Cladding, Electroplating (Chromium Plating, Metal Spraying, Cementation-Sheradizing, Colourizing, Chromizing).

UNIT – IV

Introduction to Polymers and Nano-materials

Polymerization, Classification of polymers, Addition and Condensation Polymerizations. Plastics - Thermosetting and Thermoplastics. Preparation, Properties and Uses of Polyethylene, PVC, Teflon, Bakelite, Nylon, Polyester, Polyurethane, Ziegler-Natta catalyst, conducting polymers.Rubber-Processing of Natural Rubber, Vulcanization and Compounding. Elastomers: Buna-S, Buna- N, Thiokol.

Introduction to Nano-materials: Fullerenes, Nano-tubes, Nano-wires, Nano-cones, Nano-dots, Nano-sphere, Haeckelites. Their electronic and mechanical properties, Production methods for CNTs. Applications of nano materials in i) Medicine ii) Catalysis iii) Environmental Technologies iv) Electronics& related fields. v) Mechanics.

UNIT – V

Fuels & Lubricants

Fuels: Classification, crude oil: composition and fractionation, Octane & Cetane Number and their significance; calorific value of fuel, Determination of calorific value of fuels, bomb calorimeter, Solid fuels - Proximate and ultimate analysis, Numericals problems.

Lubricants: Functions of lubricants, Mechanism of Lubrication (thick film or hydrodynamic lubrication, thin film or boundary lubrication, extreme pressure lubrication), Classification and properties of lubricants-Viscosity, Flash and fire point, Cloud and pour point, Aniline point, Neutralization number and mechanical strength. Numerical problems on acid value and saponification value.

Text Books:

1. Chemistry in Engineering & Technology (Vol I & II) (Latest ed.) By J.C. Kuriacose& J. Rajaraman, Tata McGraw-Hill Co, New Delhi.
2. Engineering Chemistry by O.G. Palanna, Tata McGraw-Hill Co, New Delhi.

Reference Books:

1. Atkins' Physical Chemistry by Peter W. Atkins and Julio de Paula, Oxford University Press.
2. Principles of Physical Chemistry (Latest ed.) By Puri, Sharma & Pathania.
3. Organic chemistry, Morrison and Boyd, Pearson Prentice Hall, 2011
4. Environmental chemistry, S.E. Manahan, 9th edition, CRC Press.
5. Textbook of polymer science by F.W. Billmeyer, Wiley India.

Engineering Chemistry Lab

List of Experiments

1. Estimation of hardness of water by EDTA method
2. Estimation of total alkalinity in the given water sample.
3. Estimation of dissolved oxygen in the given water sample.
4. Estimation of available chlorine in the given sample of bleaching powder.
5. pH-metric titration.
6. Determination of viscosity of lubricants by Redwood viscometer / Ostwald's viscometer.
7. Determination Surface Tension of lubricants.
8. Determination of Flash point of a given oil by Pensky_Marten's flash point approach.
9. To Determine Saponification-value of the given Lubricating Oil.
10. To Determine Acid-Value of the given Lubricating Oil.
11. To determine the moisture, volatile and ash contents in a given coal sample by proximate analysis.
12. To study the adsorption of acetic acid on activated charcoal.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Introduction to Electrical Engineering**	Course Code: **EA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **I**

UNIT – 1
D.C. NETWORK THEORY
Review of basic circuit theory concepts, Mesh and Nodal analysis, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Star–delta transformation, Magnetic Circuits.

UNIT – 2
A.C. CIRCUITS & MEASURING INSTRUMENTS
*Single Phase A.C.:*Phasor representation of voltage and current, A.C. circuit behavior of resistance, inductance, capacitance & their combination in series and parallel, Power triangle, Power factor, Concept of series & parallel resonance.
*Three Phase A.C.:*Star – delta connections, Relation between line and phase quantities, three phase power and its measurement, What is 3 phase 4 wire and 3 phase 5 wire system?
Measuring Instruments: Construction and principle of voltage and current measuring instruments.

UNIT – 3
TRANSFORMERS
Principle of operation, Types of construction, Phasor diagram, Equivalent circuit, Efficiency and voltage regulation of single phase transformer, O.C. and S.C. tests.

UNIT – 4
D.C. & SYNCHRONOUS MACHINES
D.C. Machines: Construction and working principle of d.c. generator and d.c. motor, Types of d.c. machines, E.M.F. equation, Torque equation, Magnetization and load characteristics, Losses and efficiency, Need of starter in d.c. motors.
Synchronous Machines: Construction and Principle of operation of Alternator and Synchronous Motor.

UNIT – 5
INDUCTION MOTORS
Three Phase Induction Motors: Principle of operation of 3-Ø induction motor, Types of 3-Ø induction motor, Need of starters in 3-Ø induction motors, Slip – torque characteristics,
Single Phase Induction Motor: Principle of operation of single phase induction motor, Methods of starting of single phase induction motor.

Reference Books:
1. V. Del Toro. " Principles of electrical Engineering, "Prentice hall International.
2. W.H. Hayt& J.E. Kemmerly," Engineering circuit Analysis, "McGraw Hill.
3. I. J. Nagrath, "Basic Electrical Engineering," Tata Mc. Graw Hill.
4. A. E. Fitgerald, D.E., Higginbotham and A Grabel, "Basic Electrical Engineering" McGraw Hill
5. H. Cotton, "Advanced Electrical Technology" Wheeler Publishing.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Basic Electrical Engineering Lab

(Any Ten)

1. Verification of Network Theorems.
2. Study of diode characteristics. Study of phenomenon of resonance in RLC series circuit.
3. Measurement of power in a three phase circuit by two wattmeter method.
4. Measurement of efficiency of a single phase transformer by load test.
5. Determination of parameters and losses in a single phase transformer by OC and SC test.
6. Study of characteristic of DC Motor.
7. Study of characteristic of AC Motor.
8. DC generator characteristics.
9. 10. Speed control of dc shunt motor.
10. Study running and reversing of a three phase induction motor.
11. Study of a single phase energy meter.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Introduction to Electronics & Communication**	Course Code: **FA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **I**

UNIT 1: Fundamental of Semiconductors ***10 L***

Energy bands in semiconductors, intrinsic and extrinsic semiconductors, Fermi Level in Intrinsic and Extrinsic semiconductor, Carrier transport in semiconductors: diffusion current, drift current, mobility, Hall Effect and resistivity. Generation and recombination of carriers.

UNIT 2: Application of Low Power and High Power Diodes ***10 L***

Diode circuits: Construction, Junction diode characteristics, Half and full wave rectifiers - Expression for efficiency and ripple factor - Bridge rectifier – π Filter circuits, Clipper, Clamper and multipliers using diodes, Zener Diode Characteristics - Regulated power supply using Zener diode.

UNIT 3: Transistor fundamentals ***8 L***

Transistor circuits: Characteristics of a transistor in CB, CE and CC modes - Relatively merits - Biasing of Transistors - Load Line and operating point concept (both AC and DC). Construction and working of JFET and MOSFET.

UNIT 4: Digital fundamentals and Introduction to Signals ***8 L***

Basic logic gates: AND, OR, and NOT – implementation of all gates using Universal gates, Number Systems conversions, Boolean algebra, K-map (upto 4 variables). Source of Information, Types of Signals.

UNIT 5: Basics of Communications & Instrumentation ***9 L***

*C*ommunication Systems, Communication Channels, Need of modulation, Types of modulations (Wave shapes and final expression only), Study of Piezoelectric, PMMC, LVDT and Strain Gauge transducers and their classifications and display device (7 segment) only.

Reference Books:

Unit 1. Electronics Devices and Circuits, Millman and Halkias, Tata McGraw Hill, 4th ed.
Unit 2 & 3. Electronic Devices and Circuit Theory, Robert L. Boylestad, Prentice Hall Higher Edu., 2000.
Unit 4. Digital Design, Morris Mano, PHI
Unit 4. Modern Digital & Analog Communications, B. P. Lathi, OUP
Unit 5. Electronic Communication Systems, John Kennedy , Tata McGraw Hill, 4th ed.
Unit 5. Electronic Instrumentation - H. S. Kalsi

ELECTRONICS ENGINEERING LAB.

1. To identify and Study of the various component and Devices of electronics with their specification (CRO, Function Generator, Multimeter, Power Supply, resistor, capacitor, inductor, ICs, LED, potentiometer etc.)
2. To study the V-I characteristics of PN diode and Zener diode.
3. To find the efficiency of Rectifiers and ripple factor of capacitive and non-capacitive half wave and full wave rectifier.
4. To Study and Verify clipper and clamper with biased circuits.
5. To find the characteristics of CB and CE amplifiers.
6. Determine the characteristics of FET.
7. To find out the power energy of various periodic and non periodic signals.
8. To verify the logic gates using diodes.
9. Study and observations of AM & FM Waveforms.
10. Study of various transducers (Strain Gauge).

***** *Plus 2-3 value added experiments can be performed.*

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Professional Communication – I**	Course Code: **HA1210**
Credit: **3.5**	L **3** T **1** P **0**
Year: **1st**	Semester: **I**

UNIT 1: **COMMUNICATION** **(6 Hrs)**

1. Communication: Definition and Process of Communication.
2. Types of Communication: Formal and Informal Communication, Verbal and Non-Verbal Communication.
3. Barriers to Communication: Intrapersonal and Interpersonal Barriers. Semantic Barriers, Physical Barriers, Psychological Barriers, and Organizational Barriers.

UNIT 2: **LISTENING SKILLS & SPEAKING SKILLS** **(8 Hrs)**

1. Importance and Objective of Listening Skills, Process of Listening, Listening and Hearing, Types of Listening, and Methods for Improving Listening Skills
2. Listening Comprehension: Identifying General and Specific Information.
3. Listening for Note taking and drawing Inferences.
4. Importance of Speaking Skills, Types of Speaking, Methods for Improving Speaking Skills
5. Introduction to Phonetic Transcription: Familiarization with British and American Usage.

UNIT 3: **READING SKILLS** **(4 Hrs)**

1. Importance of Reading Skills, Types of Reading Skills, Methods of Improving Reading Skills.
2. Vocabulary Building: Antonyms, Synonyms, Homophones, Homonyms, and One-Word Substitution, Etymology and roots.

UNIT 4: **WRITING SKILLS** **(10 Hrs)**

1. Importance of Writing Skills, Types of Writing Skills, and Methods for Improving Writing Skills.
2. Sentence and Paragraph Construction. Writing Expository, Argumentative and Deductive Order etc Paragraphs.
3. Précis Writing
4. Basic Letter Writing: Format and Style of Formal Letters.

UNIT 5: **ONE ACT PLAY** **(6 Hrs)**

Practice of LRSW through the study of the one act play, ***THE REFUND*** by **Fritz Karinthy**.

TEXT BOOK

1. Gupta, Ruby. Basic Technical Communication, Cambridge University Press, New Delhi.2012.

REFERENCE BOOKS

1. Rizvi, Ashraf. Effective Technical Communication, McGraw Hill, New Delhi. 2005
2. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011
3. Tyagi, Kavita& Padma Misra. Basic Technical Communication, PHI, New Delhi. 2011
4. Lewis, Norman. Word Power Made Easy, W.R Goyal Pub. & Distributors.1995
5. Ford A, Ruther. Basic Communication Skills; Pearson Education, New Delhi.2013
6. Aslam, Mohammad. Introduction of English Phonetics and Phonology Cambridge.2003
7. Kameswari, Y. Successful Career Soft Skills and Business English, BS Publications, Hyderabad.2010
8. English Pronouncing Dictionary, Cambridge.2012
9. The Oxford Guide to Writing and Speaking. OUP, Delhi.2011

Professional Communication – I Lab

Lab 1	Neutralization of Mother Tongue Influence through manner of articulation
Lab 2	Common Errors in English and Indianisms.
Lab 3	Introduction to Speech Sounds – Practicing Vowel and Consonant sounds
Lab 4	Syllable, word stress, Sentence stress
Lab 5	Pause group, Intonation & Rhythm
Lab 6	Functional English
Lab 7 & 8	Everyday Conversation : Greetings, Apologies, Requests, At a Restaurant, Shopping, Groceries, Hiring an Apartment, Travel Courses, etc.
Lab 9	Developing Listening skills through cultural movies
Lab 10 &11	Movie - To provide exposure to the target language
Lab 12	Final evaluation based on Extempore

References: (Software and Videos)

1. Wordsworth English Language laboratory software
2. Wordsworth Prep 1-2-3
3. Connected Speech Level 1-2-3
4. Learn To speak English CD 1-2-3-

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Computer Fundamentals and 'C' Programming**	Course Code: **DA1210**
Credit: **4**	L **3** T **0** P **2**
Year: **1st**	Semester: **I**

UNIT 1 **(8 L)**

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system: Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

UNIT 2 **(8 L)**

Standard I/O in C, Fundamental data types- Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external**,** Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Fundamentals of C programming: Structure of C program**,** writing and executing the first C program, components of C language. Standard I/O

UNIT 3 **(8 L)**

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch**,** program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break, continue and goto statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

UNIT 4 **(8 L)**

Arrays: Array notation and representation, manipulating array elements using one and two dimensional arrays, linear searching, sorting (bubble sort), strings, matrix manipulation (transpose, addition, multiplication).

Structures: Purpose and uses of structures, declaring structures, array of structures, union, enumerated data types

UNIT 5 **(8 L)**

Pointers: Pointers: pointer variables, pointer operator, pointer expression, array of pointers, multiple indirection, pointers to functions, dynamic memory allocation functions.

File handling**,** standard C preprocessors**,** defining and calling macros, conditional compilation.

Text Books:

1. YashwantKanetkar, "Let us C", BPB Publications, 2nd Edition, 2001.
2. Herbert Schildt, "C:The complete reference", OsbourneMcgraw Hill, 4th Edition, 2002.
3. Computer Fundamentals and Programming in C. ReemaThareja, Oxford Publication
4. P.K. Sinha "Computer Fundamentals" B.P.B Publication.

Reference Books:

1. Raja Raman, "Computer Programming in C", Prentice Hall of India, 1995.
2. Kernighan & Ritchie, "C Programming Language", The (Ansi C Version), PHI, 2nd Edition.
3. Byron Gottfreid "Schaum's Outline of Programming with C".

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20
List of Programs in 'C' Lab

Lab 1	(a) WAP to perform simple arithmetic operations using different data types. (b) WAP to show swap of two no's without using third variable.
Lab 2	(a) WAP to find the roots of a quadratic equation. (b) WAP to check the number is odd or even and find the sum of all odd and all even separately.
Lab 3	(a) WAP to find out whether the given number is prime or not. Find sum of all prime upto N. (b) WAP to reverse a given number and check the palindrome status.
Lab 4	WAP to print corresponding days of a week using switch case.
Lab 5	WAP to find and generate the Armstrong number.
Lab 6	WAP to print pattern triangle like Floyd's, Pascal, pyramid triangle.
Lab 7	(a) WAP to interchange two values using call by value and call by reference. (b) WAP to print factorial of a number using recursion & without using recursion.
Lab 8	WAP to print Fibonacci series. (**a**) Without using function (**b)** using function (**c)** using recursion
Lab 9	(a) WAP to print an array and find greatest/smallest element of an array. (b) WAP to perform linear searching in an array.
Lab 10	(a) WAP to insert/ delete element from an array. (b) WAP to sort the array's element using Bubble sort.
Lab 11	WAP to perform the following string functions. **a.** Strlen **b**. strcmp **c.**strcpy **d**. strcat **e**. strlwr **f**.strupr
Lab 12	Declare a suitable structure of a college and print the name and DOB of the student have scored more than sixty percent marks in end semester exam.
Lab 13	Declare a suitable structure for an organization and print all the names of employees having salary more than Rs.1000.

Course Title: **Workshop Practice**			Course Code: **LA1110**
Credit: **1**	L **0**	T **0**	P **2**
Year: **1st**			Semester: **I**

List of Experiments

1. Carpentry: To make a T-Lap joint with soft wood.
2. Arc Welding: To make a Lap joint with mild steel flat by arc welding process.
3. Gas Welding: To make a Lap joint of M.S. sheet with gas welding process.
4. Fitting: To make a plug and socket joint with M.S. flat.
5. Machine Shop: To turn a M.S. rod on lathe to prepare a turning specimen.
6. Sheet Metal: To make a square tray with G.I. sheet.
7. Study of Foundry and Forging tools and equipments

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Engineering Mathematics – II**	Course Code: **JA2010**
Credit: **3.5**	L **3** T **1** P **0**
Year: **1st**	Semester: **II**

UNIT I: **(10L)**

Linear Algebra

Matrices; Inverse of matrix; Echelon form; Rank of matrix; Consistency and solution of a system of linear equations; Linear dependence and independence of vectors; Matrix transformations; Eigen values and eigenvectors; Cayley– Hamilton theorem; Reduction to diagonal form; Vector spaces; Sub spaces; Basis; Dimension; Linear Transformation**.**

UNIT II: **(8L)**

Differential Equations

Linear differential equations first order and first degree; Linear differential Equations of higher orders with constant coefficients; Complementary functions and Particular integrals; Euler-Cauchy linear differential equations; Simultaneous linear differential equations; Method of variation of parameters.

UNIT III: **(6L)**

Infinite Series

Introduction; Sequences; Series; Convergence; Series of positive terms; Comparison test; Integral test; D'Alembert's Ratio test; Cauchy's root test; Alternating series; Leibnitz rule.

UNIT IV: **(8L)**

Fourier Series

Periodic functions; Fourier series of Periodic functions; Euler's formulae; Functions having arbitrary period; Change of intervals; Even and Odd functions; Half range sine and cosine series.

UNIT V: **(8L)**

Laplace Transform

Laplace Transform; Existence theorem; Properties of Laplace Transform ; Laplace Transform of derivatives and integrals; Laplace Transform of Periodic functions; Unit Step function and Error Function; Dirac- Delta function; Unit impulse function; Convolution theorem; Applications of Laplace Transform to solve linear and simultaneous differential equations.

Text Books:

1. R. K. Jain & S. R. K. Iyenger, **Advanced Engineering Mathematics**, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.
2. E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, John Wiley & Sons, U.K., 2006.

Reference Books:

1. W. E. Boyce and R. Di Prima, **Elementary Differential Equations**, (8th Edition), John Wiley & Sons, U.K., (2005).
2. B. S. Grewal, **Higher Engineering Mathematics**, 42nd Edition, Khanna Publication, New Delhi, India, 2012.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Engineering Physics**	Course Code: **OA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **II**

UNIT I:

Relativistic Mechanics: Inertial and Non-inertial Frames; Postulates of Special Theory of Relativity; Galilean and Lorentz Transformation; Length Contraction and Time Dilation; Addition of Velocities; Variation of Mass with Velocity and Mass Energy Equivalence.

UNIT II:

Interference: Introduction; Coherent Sources; Analytical treatment of interference; Young's double slit experiment and its analysis; Conditions of Interference; Fresnel's Biprism; fringes with white light; Determination of wavelength of monochromatic light by using Fresnel's Biprism method; Displacement of Fringes; Interference in plane parallel thin film (reflected and transmitted light) and wedge shaped film(reflected light only); Newton's Rings; Determination of wavelength of monochromatic light and determination of refractive index of a liquid by using Newton's ring method.

UNIT III:

Diffraction: Introduction; Difference between Interference and diffraction; resultant of superposition of n simple harmonic coherent vibrations; Fraunhofer diffraction due to single slit: resultant intensity; conditions of maxima; minima; angular and linear width of central maximum; Double slit diffraction: resultant intensity; missing order; N-slit diffraction : resultant intensity; conditions of maxima and minima; missing orders; angular width of principal maxima; Diffraction grating: formation of spectra and missing order spectra in spectrum; dispersive power of grating; Resolving power; Rayleigh Criterion of resolution; Resolving power of plane transmission diffraction grating.

UNIT IV:

Polarization: Polarised and unpolarised light and its pictorial representation; plane of polarisation and plane of vibration; Phenomenon of Double Refraction; positive and negative double refracting crystals; properties of ordinary and extra-ordinary Rays; Nicol Prism and its application as a polariser and analyser; Mathematical analysis of superposition of two linearly polarised light vectors; retardation plates – half wave plate and quarter wave plate; Production and detection of Plane; Circularly and Elliptically Polarized Light.

Laser: Spontaneous emission; stimulated emission and stimulated absorption; Einstein's A and B Coefficients and relation between them; Principle of Laser Action; Construction and Working of He-Ne; Semiconductor Laser.

UNIT V:

Wave Mechanics : Wave Particle Duality; de Broglie Concept of Matter Waves; Davisson and Germer experiment; Concept of wave packet; group and phase velocity; Heisenberg Uncertainty Principle and its applications viz. non existence of electron in nucleus; radius and energy of Bohr's first orbit; Schrödinger time independent and time dependent wave equation; Physical interpretation of wave function; Application of Schrodinger wave equation: Particle in a one dimensional box (eigen function and eigen values).

Introduction to Fibre Optics: Fundamental ideas about optical fiber; Types of fibers; Acceptance angle and cone; Numerical Aperture.

Text Books:

1. AjoyGhatak**; Optics;** Tata Mc-Graw Hill Education;2009.
2. Subramanyam; BrijLal;**A Text Book of Optics**; S. Chand, 2004.
3. K. Thyagarajan, AjoyGhatak; **Lasers: Fundamentals and Applications**; Second;Springer, 2010.
4. AjoyGhatak& K. Thyagarajan ;**Introduction to Fiber optics;**Cambridge University Press,1998.
5. Halliday, Resnick& Walker; **Principles of Physics**; Nineth, Wiley, India;2013

Reference Books:

1. Arthur Beiser ;**Concepts of Modern Physics**; Tata Mc-Graw Hill Education;2003.
2. Robert Resnick;**Introduction to Special theory of Relativity** ; First; John Wiley& Sons; 1968.
3. Jenkins and White ;**Fundamentals of Optics**; Fourth; McGraw-Hill;2001
4. David. J. Griffith; **An Introduction to Quantum Mechanics**;Second; Pearson prentice Hall; 2004.
5. Young and Freedman;**Sears and Zemansky's University Physics**,Tenth; Addison-Wesley, 2000.

List of Experiments

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help ofFresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locatethe position of cardinal points.
4. To determine the specific rotation of cane sugar solution using bi quartz polarimeter.
5. To determine the wavelength of spectral lines using plane transmissiongrating.
6. To determine the specific resistance of the material of given wire usingCarey Foster's bridge.
7. To determine the variation of magnetic field along the axis of a currentcarrying coil and then to estimate the radius of the coil.
8. To verify Stefan's Law by electrical method.
9. To calibrate the given ammeter using potentiometer.
10. To calibrate the give voltmeter using potentiometer.
11. To determine energy band gap of a given semiconductor material by p-n junction method.
12. To determine the viscosity of water by Poisseuille's method.

Note: Additional experiments may be added based on contents of syllabus.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Essentials of Mechanical Engineering**			Course Code: **LA1210**
Credit: 4**.5**	L **3**	T **1**	P **2**
Year: **1st**			Semester: **II**

UNIT – I **9L**

Introduction to Engineering: Difference between Science and Technology, history of wheel, introduction to prime movers, transmission system, belt, pulleys, gear system and nomenclature, braking system, Mechanism, lever mechanism, Working principle of power generation system, hydel power plant, thermal power plant and its main components.

Coplanar Force system: Resolution of force in two mutually perpendicular direction Free Body Diagram, Moment, Varignon's theorem, static equilibrium, Lami'sTheorem, type of joints/Support, Type of load: point load, uniformly constant and varying loads, beam and its type.

UNIT – 2 **7L**

Engineering material and their properties: Details of hook's law, Proportional limit, Yield point, Yield Stress, Engineering strain, Engineering stress, True stress and Strain, Plasticity, Elasticity, Allowable Strength, Hardness, Ductility, toughness, Fatigue, creep, strain energy, Impact Strength, Young modulus of Elasticity, Bulk Modulus, Poission Ration and its relation in between.

Stress and strain: Normal stress and strain, principle of Superposition, Deformation in stepped and composite bar.

UNIT – 3 **7L**

Thermodynamics: Macroscopic & microscopic study point of view, System, Surrounding and Universe, Phase, Property, State, Path, Process, Cyclic and non-cyclic processes, Quasi static process, Reversible and irreversible processes , Thermodynamic equilibrium, Concept of continuum, Energy and its forms, Enthalpy, Zeroth law, Different temperature scales and theory of temperature and Pressure measurement.

UNIT – 4 **8L**

Laws of Thermodynamics: Thermodynamic definition of work, Thermodynamic processes, Calculation of work in various processes and sign convention, Non-flow work and flow work, Joules' experiment, First law of thermodynamics, Internal energy and enthalpy, First law of thermodynamics applied to open systems, Steady flow energy equation and its applications, First law analysis for closed system (non flow processes), Limitations of first law of thermodynamics, PMM-I.

Statement of Second Law of Thermodynamics: Kelvin Planck's statement and Clausius statement and their equivalence.

UNIT – 5 **9L**

Power generation: Air standard cycle**,** IC Engine**,** Carnot cycle, Otto cycle, Diesel cycle, Important components of I.C.Engine, two stroke and four stoke engine, S.I. and C.I. engines, efficiency of Otto and diesel cycle

Basics of Heat Transfer: Concepts of the mechanisms of heat flows: conduction, convection and Radiation heat transfer application in engineering.

Reference Books:

1. Basu,A.R; A Text book of Engineering Mechanics(Applied Mechanics);2003 Edition; Dhanpat Rai & co.(p) Ltd, Delhi.

2. Chandramouli, P.N; Engineering Mechanics; Second Printing; PHI Learning Private Limited, Delhi; 2013.
3. Rajput, R. K; Material Science; S. K. Kataria & Sons, New Delhi.
4. Dubey, N. H; Engineering Mechanics, Statics and Dynamics; First reprint; McGraw Hill Education (India) Private Limited, New Delhi, 2013.
5. Ratan, S.S; Theory of machines; Second Edition; Tata McGraw Hill Publishing Company Limited, New Delhi.
6. Nag.P.K.; Engineering Thermodynamics; 3rd Edition; Tata McGraw Hill Publishing Company Limited, New Delhi.
7. Nag.P.K.; Heat and Mass Transfer; Tata McGraw Hill Publishing Company Limited, New Delhi.
8. Kumar.D.S; Basic of Mechanical Engineering; S. K. Kataria & Sons, New Delhi.

Essentials of Mechanical Engineering Lab

List of Experiments

1. Tensile test
2. Impact test
3. Hardness test
4. Pulley experiment
5. Experiment on conduction heat transfer
6. Demonstration of Impulse and reaction turbine
7. Study of 4s and 2S engine petrol Engine
8. Study of 4s and 2S engine Diesel Engine
9. Study of refrigerator and air conditioning

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Professional Communication – II**			Course Code: **HA2210**
Credit: **3.5**	L **3**	T **0**	P **1**
Year: **1st**			Semester: **II**

UNIT 1: **PROFESSIONAL COMMUNICATION** **(6 Hrs)**

1. Importance and Features of Business Communication, Flow and Channels of Communication in an Organization.
2. Introduction to Technical Communication, Types and History of Technical Communication.
3. Difference between General and Technical Communication, and Importance of Technical Communication.
4. Characteristic of Technical Communication, and Elements of Style.
5. Process of Preparing a Technical Document.
6. Elements and Features of Scientific Articles.
7. Compunication, E- mail, E- tools and Encyclopedia.

UNIT 2: **BUSINESS CORRESPONDENCE** **(8 Hrs)**

1. Business Correspondence – Principles, Features, Types, Format and Layout of Business Letter.
2. Inter Office Correspondence – Letters of Enquiry, Quotation, Order, Sales, and Complaint.
3. Intra Office Correspondence: Notice, Agenda, Minutes, and Memorandum.
4. Job Application Letter.

UNIT 3: **TECHNICAL PROPOSAL and TECHNICAL REPORT** **(8 Hrs)**

1. Technical Proposal - Introduction, Purpose, Features, Types, Format, Importance, and Writing Technical Proposals and Plagiarism.
2. Technical Report - Features, Types, Style, Format, Relevance, and Writing Technical Reports.

UNIT 4: CORPORATE COMMUNICATION SKILLS **(8 Hrs)**

1. Dimensions and importance of EQ
2. Interpersonal communication skills - Life Position, and Transactional Analysis
3. Johari Window: Role of Feedback and Disclosure in Communication; Accepting Criticism
4. Cross Cultural Communication
5. Attitude
6. Perception
7. Personality Attributes and Communication: Self Esteem, Self-Monitoring, Impression Management, and Locus of Control.
8. Conflict and Negotiation

UNIT 5: PROJECT **(6 Hrs)**

REPORT WRITING/ PROPOSAL WRITING

The students will write a Report **OR** a Proposal consisting of 10-15 pages.

REPORT WRITING

1. **For B.Tech. students**-
    a. Technical Report describing new machinery, a report on the sudden break down in production unit, and market survey report for formulating new market strategy.
2. **For B.Pharma. students**
    a. Technical Report based on the site inspection of a drug manufacturing unit, Survey Report on Health Awareness and Self-Medication.
3. **For B.Arch. students**

a. Technical Reports based on a Site Inspection for Geographical and Geological aspects of a particular location, A Report on the Architectural Survey of a Monument. Architectural

PROPOSAL WRITING

1. **For B.Tech. students**
   a. Technical Proposal to organize a Technical Training Program, To develop new range of a product and to start a new venture.
2. **For B.Pharma. students**
   a. Technical proposal to establish a new laboratory, To create new drug-composition and to visit to a Super Specialty Hospital.
3. **For B.Arch. students**
   a. Technical Proposal for an Archeological Site visit , To Construct New Buildings.

Report Writing and Proposal Writing carries 30 marks equivalent to three class tests.

TEXT BOOK

1. Gupta, Ruby. Advanced Technical Communication, Cambridge University Press, New Delhi. 2011.

SUGGESTED REFERENCE BOOKS

1. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011.
2. Tyagi, Kavita& Padma Misra. Advance Technical Communication, PHI, New Delhi.2011
3. Technical Communication, Cengage Learning, New Delhi.2010
4. Technical Communication, OUP, New Delhi. 2013
5. Wallace, Masters Personality Development, Cengage Learning, New Delhi.2006
6. Barrass, Robert: Students Must Write, Foundation books, Cambridge, New Delhi.2006
7. Rao, Bhaskar: Successful Career Soft Skills and Business English, BS Publications, Hyderabad.2012
8. Chakrawarthi: Soft Skills for Professionals, Wiley India.2011

Professional Communication – II Lab

Lab 1	Vocabulary Building
Lab 2	Telephone Etiquette: Making an appointment , answering Calls
Lab 3	Public Speaking
Lab 4	Group Discussion: Do's and Don'ts of GD
Lab 5 & 6	Interview Skills: Preparation
Lab 7	PP Presentation Skills: Techniques of making effective presentation
Lab 8	Meeting : Conducting meetings effectively
Lab 9	Developing Negotiating skills
Lab 10 &11	Reading Comprehension
Lab 12	Evaluation

References: (Software and Videos)

1. Wordsworth English Language laboratory software
2. Wordsworth Prep 1-2-3
3. Communicate
4. Train 2 Success
5. Additional PPTs

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Computer Programming in C++**			Course Code: **DA2210**
Credit: **4**	L **3**	T **0**	P **2**
Year: **1st**			Semester: **II**

Unit -1 **8L**

Introduction to Object Oriented Programming, including methodologies, programming techniques, Object Oriented languages.
Overview of C++ basic structures, including the main () function, C++ data types, different type of operators expressions and statements, standard Input/output, Simple flow of control, Defining user defined Functions.

Unit -2 **8L**

General overview of objects and classes, Object and classes in C++, including class definition, Defining members inside or outside, accessing of members, constructors, types of constructors, destructors and Pointer to class object.

Unit-3 **8L**

Polymorphism: function overloading, methods of overloading, constructor overloading, Operator overloading.
General overview of inheritance: Introduction, Categories of inheritance, public/protected/private inheritance, constructors and destructors in derived classes, and Virtual Base class.

Unit-4 **8L**

Function overriding and virtual functions, Abstract class and abstract base class, Friend functions, Templates in C++, function templates, class templates, templates and inheritances, templates and static members.

Unit-5 **8L**

File handing in C++: opening of file, closing of file, text files, binary files, Reading and writing into a file. Exception Handling in C++, including usage, try, throw and catch.

Text Books:

1. Kip R. Irvine, C++ and Object-Oriented Programming, Prentice Hall, 1997
2. R. Lafore, "Object Oriented Programming using C++", BPB Publications, 2004
3. E Balagurusamy "Object Oriented Programming with C++" T.M.H 2nd edition

Reference Books:

1. Schildt Herbert, "C++ Programming", 2nd Edition, Wiley DreamTech.
2. YashwantKanethkar, "Object Oriented Programming using C++",BPB, 2004

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

List of Programs in 'C++' Lab

Lab 1	(a) WAP to print first 10 prime numbers. (b) WAP to demonstrate nested loops. (c) WAP to print reverse of a given number. (d) WAP to read two numbers from keyboard and display the larger one.
Lab 2	(a) Create a class called Employee that includes three pieces of information as instance Variables – a first name (type String), a last name (type String) and a monthly salary (Double) (b) Create a constructor in above class to initialize the three instance variables. Provide a get method for each instance variable. (c) WAP to demonstrate destructors.
Lab 3	(a) Program to implement different types of inheritances like Multiple, Multilevel and hybrid. (b) Write a program in C++ demonstrating the public, protected and private parameters. (c) Write a program in C++ to demonstrate destructor in inheritance. (d) WAP to demonstrate encapsulation property of OOPs.
Lab 4	(a) Write a program that uses a class where the member functions are defined inside a class. (b) WAP that uses a class where member functions are defined outside a class. (c) WAP that uses a class where member functions are defined inside a class. (d) WAP to demonstrate the use of Static Data members.
Lab 5	(a) WAP to demonstrate the use of Dynamic Constructor. (b) WAP to demonstrate the use of function Template. (c) Illustrate and implement the C++ program to initiate the base constructor from derived class constructor.
Lab 6	(a) Write a C++ program to find the largest and smallest element of an array.
	(b) Create a class Matrix. Implement all possible matrix operations for Matrix type objects by overloading them.
Lab 7	(a) Create 2 classes OM and DB which store the value of distance. DM store distances in meters and cm and DB in feet and inches. Write a program that can read values for the class objects and add 1 object OM with another object of DB.
	(b) Define a class to represent bank account. Include the following members: **Data members** 1. Name of depositor. 2. Account number. 3. Type of account. 4. Balance amount in the account. **Member functions** 1. To assign initial values. 2. To deposit an amount. 3. To withdraw an amount after checking the balance. 4. To display name and balance. Write a main program to test the program.
Lab 8	(a) WAP to demonstrate static class data. (b) WAP to demonstrate the use of Public, Private and protected classes.
Lab 9	(a) WAP to illustrate the concept of call by reference. (b) WAP to illustrate the concept of unary operator overloading. (c) WAP to illustrate the concept of binary operator overloading.
Lab 10	(a) WAP to demonstrate the use of function overloading. (b) WAP using multiple inheritance for collecting employee details.
Lab 11	(a) WAP using function template to find maximum of two Data. (b) WAP to calculate factorial of given number using copy constructor.
Lab 12	(a) WAP to sort five float and integer numbers using template function (use bubble sort). (b) Demonstrate the use of different types of polymorphism.
Lab 13	(a) Write a function to read a matrix of size M × N from keyboard. (b) WAP to implement aggregation concept.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Environmental Science**	Course Code: **BA1010**
Credit: **2**	L **2** T **0** P **0**
Year: **1st**	Semester: **II**

Unit – 1 **(6L)**

Natural Resources: Renewable and non-renewable resources

Definition, scope, importance and need for public awareness, natural resources and associated problems.

- Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
- Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
- Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture and green revolution, water logging, salinity.
- Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources.
- Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Unit – 2 **(5L)**

Ecosystems

Concept, Structure and function of an ecosystem, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the Forest and aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit – 3 **(5L)**

Biodiversity and its conservation

Introduction – Definition: genetic, species and ecosystem diversity. Bio geographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-sports of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit – 4 **(6L)**

Environmental Pollution

Definition, Cause, effects and control measures of:-

a. Air pollution b. Water pollution c. Soil pollution
d. Marine pollution e. Noise pollution f. Thermal pollution
g. Nuclear hazards

• Solid waste Management and biomedical waste: Causes, effects and control
• Role of an individual in prevention of pollution.
• Pollution effects-global warming, acid rain, ozone depletion, smog and case studies.
• Disaster management: floods, earthquake, cyclone and landslides.

Unit – 5 **(6L)**

Social Issues and the Environment

- From Unsustainable to Sustainable development
- Water conservation, rain water harvesting, watershed management
- Environmental Impact Assessment and Resettlement and rehabilitation problems.
- Climate change
- Wetland conservation.
- Role of remote sensing and GIS in environmental monitoring and analysis
- Environment Protection Act. 1986
- Air (Prevention and Control of Pollution) Act. 1981
- Water (Prevention and control of Pollution) Act 1974
- Wildlife Protection Act 1972
- Forest Conservation Act 1980.

Field work:

- Visit to a local area to document environmental assets river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

REFERENCE BOOKS:

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad –380 013, India, Email:mapin@icenet.net (R)
2. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
3. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
4. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
5. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
6. Gleick, H.P. 1993. Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
7. Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
8. Mckinney, M.L. & School, R.M. 1996. Environmental Science Systems & Solutions, Web enhanced edition. 639p.
9. AnubhaKaushik&Kaushik, C.P. 2009.Perspectives in Environmental Studies, New Age International Publishers.
10. Manahan. S.E., Environmental chemistry, 9th edition.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Engineering Graphics**	Course Code: **LA1220**
Credit: 2	L **1** T **0** P **2**
Year: **1st**	Semester: **II**

UNIT – 1
Introduction: Sheet Layout, Types of Sheet, Size of Sheets, Title blocks, Type of lines, Lettering, Dimensioning, Scale (Full, Reduced, Large) Geometrical Constructions,

UNIT – 2
Projection: Methods of Projection, Planes of Projection, Projection of points, Projection of straight lines, Projection of auxiliary planes, Projection of planes.

UNIT – 3
Projection of solids, Sections of solids.

UNIT – 4
Development of surfaces

UNIT – 5
Isometric Projections

Reference Books:
1) Bhatt N. D. & Panchal V. M, "Engineering Drawing", Charotar Publisher, 2007.
2) Dhanjay A Jolhe, "Engineering Drawing" Tata McGraw Hill, 2008.
3) Gill P.S "Engineering Graphics" S. K. Kataria & Sons, 2009
4) John K.C, "Engineering Graphics" , 2nd edition, PHI Learning Pvt. Ltd., 2010

List of Experiments

1. Introduction to AutoCAD Commands, Explaining need of AUTO CAD over Manual drafting, Simple Drawings.
2. Sheet on Lettering and Geometric construction.
3. Orthographic Projections, Basic problem based on Projection of points.
4. Sheet on Projection of Lines.
5. Sheet on Projection of Planes.
6. Sheet on Projection of Auxiliary Planes.
7. Sheet on Projection of Solids.
8. Development of Surfaces.
9. Sheet on Isometric Projections from orthogonal views.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Discrete Mathematics**	Course Code: **DA3010**
Credit:3.5	L T P **3 1 0**
Year: 2nd	**Semester: III**

UNIT 1 ***(10L)***

Permutations, Combinations, selection with & without replacement, Sets and multisets, permutation and combination of multisets, enumeration of permutation and combination of sets &multisets, placing distinguishable (indistinguishable) objects into distinguishable (indistinguishable) boxes. Inclusion-Exclusion principle, discrete probability; the rules of sum & products, generation of permutation and combination.

UNIT 2 ***(8L)***

Relations and functions-properties of binary relation, equivalence relation, partial order relation, chains and antichains, Pigeon hole principle, Lattices and Boolean algebra; Algebraic structures: binary operation, group, ring, field; Mathematical Logic: Basic connectives, rules of inference, normal forms, proof of validity, predicate logic.

UNIT 3 ***(7L)***

Basic concepts of graph theory: vertices, edges, degree, paths, circuits, cycles, complete graphs and trees. Multi-graphs, weighted graphs and directed graphs. Adjacency matrix of a graph. Connected and disconnected graphs. K-connected and K-edge connected graphs.

UNIT 4 ***(7L)***

Shortest path in weighted graphs, Eulerian path and circuits, Hamiltonian path and circuits, Planner graphs, chromatic number, edge colouring of graphs. Tree and cut sets: Tree, spanning tree and cut set, minimum spanning tree.

UNIT 5 ***(8L)***

Generating function and recurrence relations, Linear recurrence relation with constant coefficients and their solution, Homogeneous solution, particular solution and total solution, Solution by the method of generating functions.

Text Books:

1. Liu C.L., Elements of Discrete Mathematics, McGraw Hill Int. edn.
2. Kolman B & Busby C.R., Discrete Mathematical Structure for Computer Science, Prentice Hall of India Ltd.
3. Deo N., Graph Theory, Prentice Hall of India.

Reference Books:

1. Trembley J.P. &Manohar R., Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Computer Organization**	Course Code: **DA3020**
Credit:3.5	L T P **3 1 0**
Year: 2nd	**Semester: III**

UNIT 1 ***(12L)***

Register Transfer and Micro operation: Register Transfer Language, Bus and Memory Transfers, Bus Architecture, Arithmetic, Logic, Shift Microoperation, Design of ALU, Design of Fast adder.

Computer Arithmetic: Introduction, addition and subtraction algorithms, Booth Multiplication Algorithms, floating point arithmetic operation, IEEE format for floating point numbers.

Processor Organization: General register organization, Stack organization, Addressing modes, Instruction format, Data transfer & manipulations, Program Control.

UNIT 2 ***(14L)***

Control Design: Single and multiple bus architecture, Execution of a Complete Instruction, sequencing of control signals, Hardwired control, Micro programmed Control, microinstruction format. **Input-Output Organization**: I/O Interface, Modes of transfer, Interrupts & Interrupt handling, Direct Memory Access, Input-Output processor, Serial Communication.

UNIT 3 ***(12L)***

Memory Organization: Memory Hierarchy, Main Memory (RAM and ROM Chips), organization of Cache Memory, Virtual Memory, Memory management hardware. **Parallel Processing**: Flynn's classification, Pipelining- Arithmetic Pipelining, Vector Processing, Array Processor. **Multiprocessor:** Characteristic of Multiprocessor, Interconnection Structure, Interprocessor Arbitration.

Text Books:

1. Computer System Architecture, M. Mano, Pearson, 3rd Edition.

Reference Books:

1. Computer Organization, Vravice, Zaky&Hamacher (TMH Publication) Structured Computer Organization, Tannenbaum(PHI), Computer Organization, Stallings(PHI).

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Data Structure**	Course Code: **DA3210**
Credit:4	L **3** T **0** P **2**
Year: **2nd**	Semester: **III**

UNIT 1 ***(8L)***

Introduction: Concept of data structure, Types of data structures, Character String in C, Recursion, Structure, Pointer, Dynamic Allocation, Algorithms, Algorithm analysis, Complexity of algorithms and Time space trade-off. **Arrays:** Introduction, Single and multi-Dimensional Arrays, address calculation, application of arrays, Operations defined: traversal, insertion and deletion.

Stacks: Stacks, Array representation of stack, Applications of stacks, Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack.

UNIT 2 ***(8L)***

Queue: Queue, Array representation and implementation of queues, Circular queues, Operations on Queue: Create Add, Delete, and Full and Empty, De-Queue, Priority queues, Applications of Queues. **Linked Lists**: Concept of linked list, Representation and implementation of singly linked list, Circular linked list, doubly linked list, Operations on Linked lists, Concepts of header linked lists, applications of linked lists.

UNIT 3 ***(8L)***

Trees: Basic terminologies of trees, Binary tree, Complete Binary tree, Extended Binary tree, Representation of Binary tree, Binary tree traversal, Operations on Binary tree. **Binary Search Tree:** Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, B-trees.

UNIT 4 ***(6L)***

Graphs: Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Representations of Graphs, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.

UNIT 5 ***(10L)***

Searching &**Hashing:** linear search, binary search, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation. **Sorting**: Bubble sort, Insertion sort, Selection sort, Quick sort, Merge sort, Heap Sort. **File Handling:** Introduction to file handling, Data and Information, File concepts, File organization, files and streams, working with files.

Text Books:

1. "Data Structures" Schaum's Outline Series,Lipschutz, TMH.
2. Data Structures using C by A. M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub.

Reference Books:

1. "Fundamentals of Data Structures", Horowitz and Sahani, Galgotia Publication.
2. Data Structures and Program Design in C By Robert Kruse, PHI.
3. Data Structure and the Standard Template library – Willam J. Collins, 2003, T.M.H.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Computer Based Numerical & Statistical Techniques**	Course Code: **DA3220**		
Credit:4	L **3**	T **0**	P **2**
Year: **2nd**	Semester: **III**		

UNIT 1 ***(10L)***

Introduction: Numbers and their accuracy, Computer Arithmetic, Errors and their Computation, General error formula, Error in a series approximation.

Solution of Algebraic and Transcendental Equation: Bisection Method, Iteration method, Method of false position, Secant method, Newton-Raphson method, Rate of convergence of Iterative, Newton Raphsion methods.

UNIT 2 ***(16L)***

Interpolation: Finite Differences, Difference tables Polynomial Interpolation**:** Newton's forward and backward formula Central Difference Formulae: Gauss forward and backward formula, Stirling's, Bessel's, Everett's formula. Interpolation with unequal intervals: Langrange's Interpolation, Newton Divided difference Formula.

Statistical Computation: Frequency chart, Curve fitting by method of least squares, fitting of straight lines, polynomials, exponential curves, Regression Analysis, Linear and Non linear Regression, Multiple regression.

UNIT 3 ***(14L)***

Numerical Integration and Differentiation: Introduction, Numerical differentiation Numerical Integration: Trapezoidal rule, Simpson's 1/3 and 3/8 rule, Boole's rule.

Solution of differential Equations: Picards Method, Eulers Method, Taylors Method, Runge-Kutta Methods, Automatic Error Monitoring and Stability of solution.

Suggested Books:

1. Yang, "Applied Numerical Methods using MATLAB", Wiley India
2. Pradip Niyogi, "Numerical Analysis and Algorithms", TMH, 1st Edition.
3. Gerald &Whealey, "Applied Numerical Analysis", AW
4. Grewal B S, "Numerical methods in Engineering and Science", Khanna Publishers, Delhi.
5. Numerical Method Principles, analysis and algorithms, Srimamta Pal (Oxford Higher ed)
6. Rajaraman V, "Computer Oriented Numerical Methods", PHI, 3rd edition.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Programming with Java**	Course Code: **DA3230**
Credit:4	L: **3** T: **0** P: **2**
Year: **2nd**	Semester: **III**

UNIT 1 ***(6L)***

Object Modeling: Objects and classes, links and association, generalization and inheritance, aggregation, abstract class, multiple inheritance, Meta data, candidate keys, constraints.

UNIT 2 ***(6L)***

Dynamic Modeling: Events and states, operations, nested state diagrams and concurrency, advanced dynamic modeling concepts, a sample dynamic model.

UNIT 3 ***(8L)***

Functional Modeling: Data flow diagram, specifying operations, constraints, a sample functional model. OMT (object modeling techniques) methodologies, examples and case studies to demonstrate methodologies, comparisons of methodologies, SA/SD, JSD.

UNIT 4 ***(10L)***

Java Programming: Introduction, Operator, Data types, Variables, Methods & Classes, Multithread Programming, I/O, Java Applet. **Java Library:** String Handling, Input/output exploring Java.io, Networking, Applets classes, Event Handling, Introduction to AWT, Working with window, Graphics, AWT Controls, Layout Manager and Menus, Images, Additional packages.

UNIT 5 ***(10L)***

Software Development using Java: Java Beans, Java Swing, Java Servlets, Migrating from C++ to java, Application of java, Dynamic Billboard Applet, Image Menu: An image based menu, Lavatron Applets, Scrabblets, JDBC, Brief functioning of upper layer E-mail and their applications.

Text Books:

1. Herbert Schieldt, "The Complete Reference: Java", TMH.
2. E. Balagurusamy, "Programming in JAVA", TMH.

Reference Books:

1. Booch Grady, "Object Oriented Analysis & Design with application 3/e", Pearson Education, New Delhi.
2. Bjarne Stroustrup, "C++ Programming Language", Addison Wesley.
3. E. Balagurusamy, "Object Oriented Programming with C++", TMH.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Digital System Design**	Course Code: **FA3221**
Credit:4.5	L T P **3 1 2**
Year: **2nd**	Semester: **III**

UNIT-1: INTRODUCTION **8 L**

Number Systems, Basic & Universal Logic gates, Boolean algebra, Direct Conversion of various base, Negative number representations, Floating point number representation, BCD & EXCESS-3 arithmetic, Error detecting and correcting codes: Hamming code, parity code, Review and Limitation of K-Map, Quine-Mcclusky Method (Tabular Method).

UNIT-2: COMBINATIONAL LOGIC CIRCUITS **8 L**

Characterization of digital circuits: Combinational & Sequential Logic circuit, Design procedure: Adders, Subtractors, Parallel Adder, IC-74LS83 and its applications, Multiplier, Decoder, Encoder, Priority Encoder, Multiplexers, Demultiplexers and their applications, Magnitude Comparators, Code Converters, Parity checker and generator, BCD Adder.

UNIT-3: SEQUENTIAL LOGIC CIRCUITS **6 L**

Latch, Flip-Flops and their conversions, Analysis and Synthesis of Sequential Circuits, Excitation Table & Diagram, Counters: Synchronous & Asynchronous, Shift Registers and their applications, Finite State Machine: Mealy and Moore Models.

UNIT-4: MEMORIES **8 L**

Memory Characteristics and operations , Sequential, Random Access-MOS & C-MOS Static and Dynamic Memory elements, Memory organization: One dimensional and Multidimensional Arrangement, Read Only Memory, ROM as a Decoder, Memory Bank, Address Decoding of Memory (Internal & External),PAL,PLA.

UNIT-5: LOGIC FAMILIES, HAZARDS & FAULT DETECTIONS **10 L**

Logic Families: Diode, BJT & MOS as a switching element, concept of transfer characteristics, ECL, TTL, I2L, Tri-state, PMOS,NMOS and CMOS logic families- Power Consumption, Gate delay and Figure of merit (SPP),Package density, Comparison of standard logic families, pass transistor Logic, Open Collector and Totem pole output stage for TTL. Static and Dynamic Hazards, Gate Delay, Generation of Spikes, Analysis & illustration of Hazard in Combinational Circuits, fault Detection Techniques: Path Sensitization, Boolean Difference Method, K- Map Method.

Text Books:

1. Digital Design, M. Morris Mano and M. D. Ciletti, 4th Edition, Pearson

Reference Books:

1. Digital Systems: Principles and Design, Raj Kamal, Pearson
2. Maini, Digital Electronics: Principles and Integrated Circuits, Wiley India.
3. Switching Theory and Finite Automata, Kohavi, TMH Publications.

Digital System Design Lab

1. Implementation of All Logic Gates using Universal gates (NAND & NOR both).
2. Bread-board implementation (Parallel adder, One bit Multiplier, One bit Magnitude comparator, parity checker)
3. Bread-board implementation of any one code converter (i.e. Gray Code, BCD Code, Excess-3, Hex. etc.).
4. Design of shift registers (SISO, SIPO, PIPO, and PISO), up and down counters.
5. Design of Mod-6 types of Asynchronous Counters.
6. Transfer characteristics of TTL and CMOS inverters.
7. Realization of Decoder, Multiplexer, encoder and De-multiplexers using IC 74138.
8. To design & Implement PAL.
9. To design & implement PLA.
10. Clock circuit realization using 555, CMOS inverter.

*Any two (Value Added)

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Theory of Computation**	Course Code: **DA4010**
Credit:3.5	L: **3** T: **1** P: **0**
Year: 2nd	**Semester: IV**

UNIT 1 ***(7L)***

Mathematical preliminaries, alphabets, strings, languages, states, transition, transition graph, generalized transition graph, Deterministic Finite Automata, Non-Deterministic Finite Automata, Non-Deterministic Finite Automata with ϵ transitions, minimization of DFA.

UNIT 2 ***(8L)***

Conversions and Equivalence: Equivalence between NFA with and without ϵ transitions. NFA to DFA conversion; Equivalence between two DFA's, Limitations of FSM; Application of finite automata, Finite Automata with output- Moore &Melay machine and its conversion.

UNIT 3 ***(10L)***

Regular Languages: Regular sets; Regular expressions, Arden's theorem, Construction of finite Automata for a given regular expression, Pumping lemma for regular sets. Closure properties of regular sets. Grammar Formalism: right linear and left linear grammars; Equivalence between regular linear grammar and FA,Context free grammar; Derivation trees, sentential forms. Ambiguity in context free grammars; Normal forms: Chomsky normal form and Greibach normal form; Pumping Lemma for Context Free Languages, Closure property of CFL.

UNIT 4 ***(7L)***

Push Down Automata: Push down automata, definition; Acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence; Equivalence of CFL and PDA; Introduction to DCFL and DPDA.

UNIT 5 ***(8L)***

Turing Machine: Turing Machine, definition, model, Design of TM, Computable functions Church's hypothesis, Types of Turing machines: Universal Turing Machine, Halting problem, Properties of recursive and recursively enumerable languages, unsolvable decision problem, un-decidability of Post correspondence problem, Church turing Thesis.

Text Books:

1. "Introduction to Automata Theory Language and Computation", Hopcroft H.E. and Ullman J. D., Pearson Education.
2. "Introduction to Languages and the Theory of Computation", J. C. Martin, 3rd edition, Tata McGraw-Hill.
3. "Formal Languages and Automata Theory", C.K.Nagpal, Oxford.

Reference Books:

1. Cohen, "Introduction to Computer theory", Wiley India.
2. "Elements of Theory of Computation", Lewis H.P. & Papadimitrou C.H. Pearson, PHI.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Operating System**	Course Code: **DA4020**
Credit:3.5	L **3** T **1** P **0**
Year: **2nd**	Semester: **IV**

UNIT 1 ***(7L)***

Introduction: Operating system and function, Evolution of operating system, Batch, Interactive, Time Sharing and Real Time System, System protection. **Operating System Structure:** System Components, System structure, Operating System Services.

UNIT 2 ***(10L)***

Concurrent Processes: Process concept, Principle of Concurrency, Producer Consumer Problem, Critical Section problem, Semaphores, Classical problems in Concurrency, Inter Process Communication, Process Generation, Process Scheduling. **CPU Scheduling:** Scheduling Concept, Performance Criteria Scheduling Algorithm, Evolution, Multiprocessor Scheduling. **Deadlock:** System Model, Deadlock Characterization, Prevention, Avoidance and Detection, Recovery from deadlock combined approach.

UNIT 3 ***(8L)***

Memory Management: Base machine, Resident monitor, Multiprogramming with fixed partition, Multiprogramming with variable partition, Multiple base register, Paging, Segmentation, Virtual memory concept, Demand paging, Performance, Paged replaced algorithm, Allocation of frames, Thrashing, Cache memory, Organization, Impact on performance.

UNIT 4 ***(6L)***

File System: Different types of files and their access methods, directory structures, various allocation methods, disk scheduling and management and its associated algorithms, Introduction to distributed file system.

UNIT 5 ***(9L)***

I/O Management and Disk Scheduling: I/O Devices, Organization of I/O functions, Operating System Design issues, I/O Buffering, Disk Scheduling (FCFS, SCAN, C-SCAN, SSTF), Disk Caches. **Case Studies:** LINUX / UNIX Operating System and Windows based operating system.

Text Books:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley.
2. D M Dhamdhere, "Operating Systems : A Concept based Approach", 2nd Edition.

Reference Books:

1. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education.
2. Harvey M Dietel, " An Introduction to Operating System", Pearson Education.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Computer Networks**	Course Code: **DA4210**
Credit:4	L **3** T **0** P **2**
Year: **2nd**	Semester: **IV**

UNIT 1 ***(8L)***

Introduction: Motivation, OSI model, Signals and media, Bits over signals, Synchronous communication, Modulation and modems, Bandwidth, Throughput, and noise, Time division and Frequency division multiplexing, Standards, Switching methods, ISDN.

UNIT 2 ***(8L)***

Packet Transmission: Multiplexing, Frames, Error correction techniques, LAN/WAN/MAN, Topology, CSMA/CD,LAN protocol, Elementary Data link protocol- Sliding window protocols, Token passing rings, FDDI, IEEE 802.3, 802.5.

UNIT 3 ***(8L)***

Routing Algorithms: Distance-Vector, Link-State, Shortest path computation, Dijkstra's algorithm, Congestion control, WAN technologies including frame relay, X.25, ATM.

UNIT 4 ***(8L)***

Internetworking: Motivation, Concept, Goals, TCP/IP model, IP addressing with sub netting, Address binding with ARP, IP Datagram, Encapsulation IP fragmentation and reassembly, ICMP,IGMP,TCP.

UNIT 5 ***(8L)***

Network Services: Electronic mail, File transfer, Access and management, Virtual terminals, Remote procedure call.

Text Books:

1. Forouzan, B.A., Data communication and Networking, McGraw Hill (2006) 4th ed.
2. Tanenbaum, A.S., Computer Networks, Prentice Hall (2003) 4th ed.

Reference Books:

1. Comer, D.E., Internetworking with TCP/IP Vol. 1 Principles, Portals and Architecture, Prentice Hall of India (2005) 5th ed.
2. Stallings, W., Computer Networking with Internet Protocols and Tech., Prentice Hall of India (2007).

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Web Technology**	Course Code: **DA4220**
Credit:4	L **3** T **0** P **2**
Year: **2nd**	Semester: **IV**

UNIT 1 ***(8L)***

Web Essentials: Clients, Servers, and Communication. The Internet-Basic InternetProtocols – The World Wide Web-HTTP request message-response message-Web Clients Web Servers-Case Study. Markup Languages: XHTML. An Introduction to HTML History-Versions-Basic XHTML Syntax and Semantics-Some Fundamental HTML Elements-Relative URLs-Lists-tables-Frames-Forms-XML Creating HTML Documents Case Study.

UNIT 2 ***(8L)***

Style Sheets: CSS-Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets and HTML Style Rle Cascading and Inheritance-Text Properties-Box Model Normal Flow Box Layout-Beyond the Normal Flow-Other Properties-Case Study. Client- Side Programming: The JavaScript Language-History and Versions Introduction JavaScript in Perspective-Syntax-Variables and Data Types-Statements-Operators-Literals-Functions-Objects-Arrays-Built-in Objects-JavaScript Debuggers.

UNIT 3 ***(8L)***

Host Objects: Browsers and the DOM-Introduction to the Document Object Model DOM History and Levels-Intrinsic Event Handling-Modifying Element Style-The Document Tree-DOM Event Handling-Accommodating Noncompliant Browsers Properties of window-Case Study. Server-Side Programming: Java Servlets- Architecture -Overview-A Servlet-Generating Dynamic Content-Life Cycle-Parameter Data-Sessions-Cookies- URL Rewriting-Other Capabilities-Data Storage Servlets and Concurrency-Case Study- Related Technologies.

UNIT 4 ***(8L)***

Representing Web Data: XML-Documents and Vocabularies-Versions and Declaration-Namespaces JavaScript and XML: Ajax-DOM based XML processing Event-oriented Parsing: SAX-Transforming XML Documents-Selecting XMLData: XPATH-Templatebased Transformations: XSLT-Displaying XML Documents in Browsers-Case Study- Related Technologies. Separating Programming and Presentation: JSP Technology Introduction-JSP and Servlets-Running JSP Applications Basic JSP-JavaBeans Classes and JSP-Tag Libraries and Files-Support for the Model-View-Controller Paradigm-Case Study-Related Technologies.

UNIT 5 ***(8L)***

Web Services: JAX-RPC-Concepts-Writing a Java Web Service-Writing a Java Web Service Client-Describing Web Services: WSDL- Representing Data Types: XML Schema- communicating Object Data: SOAP Related Technologies-Software Installation-Storing Java Objects as Files-Databases and Java Servlets.

TEXT BOOKS

1. Jeffrey C.Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.57

REFERENCE BOOKS

1. Robert. W. Sebesta, "Programming the World Wide Web", 4th Edition, Pearson Education, 2007.
2. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", 3rd Edition, Pearson Education, 2006.
3. Marty Hall and Larry Brown,"Core Web Programming" 2nd Edition, Volume I and II, Pearson Education, 2001.
4. Bates, "Developing Web Applications", Wiley, 2006.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Database Management System**	Course Code: **DA4230**
Credit:4	L **3** T **0** P **2**
Year: 2nd	**Semester: IV**

UNIT 1 ***(8L)***

Introduction: Data base System Applications, data base System VS file System, Data Abstraction, Instances and Schemas, data Models: the ER Model, Relational Model & Other Models , Database Languages, data base Users and Administrator, data base System Structure, Storage Manager, the Query Processor, Two/Three tier architecture.

UNIT 2 ***(8L)***

E-R model: Basic concepts, Design Issues, Mapping Constraints, Attributes and Entity sets, Relationships and Relationship sets, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features

UNIT 3 ***(8L)***

Relational Model & SQL: Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra; SQL: Form of Basic SQL Query, Nested Queries, Aggregative Operators, NULL values, Logical operators, Outer Joins, Complex Integrity Constraints in SQL.

UNIT 4 ***(8L)***

Database Design: Schema refinement, Different anomalies in designing a Database, Decompositions , Problem related to decomposition, Functional Dependency, Normalization using functional dependencies, 1NF, 2NF, 3NF & BCNF , Lossless join decomposition, Dependency preserving Decomposition , Schema refinement in Data base Design, Multi valued Dependencies, 4NF, 5NF.

UNIT 5 ***(8L)***

Transaction Management: Transaction-concepts, states, ACID property, schedule, serializability of schedules, concurrency control techniques - locking, timestamp, deadlock handling, recovery-log based recovery, shadow paging.

Text Books:

1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata McGrawHill,3rdEdition.
2. Data base System Concepts, Silberschatz, Korth, McGraw hill, V edition.

Reference Books:

1. Data base Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7thEdition.
2. Fundamentals of Database Systems, Elmasri Navate Pearson Education.
3. Introduction to Database Systems, C.J.Date Pearson Education.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Linux Administration & Shell Programming**	Course Code: **DA4242**
Credit:3.5	L **2** T **1** P **2**
Year: **2nd**	Semester: **IV**

UNIT 1 ***(9L)***

Linux introduction and file system: Basic Features, Advantages, Installing requirement, Basic Architecture of Unix/Linux system, Kernel, Shell. Linux File system-Boot block, super block, Inode table, data blocks, How Linux access files, storage files, Linux standard directories. Commands for files and directories cd, ls, cp, md, rm, mkdir, rmdir, pwd, file, more, less, creating and viewing files using cat, file comparisons – cmp&comm, View files, disk related commands, checking disk free spaces. LINUX vs. UNIX operating system.

UNIT 2 ***(9L)***

UNIX system organization (the kernel and the shell), Unix File System, Basic file attributes. Essential Linux commands Understanding shells, Processes in Linux-process fundamentals, connecting processes with pipes, tee, Redirecting input output, manual help, Background processing, managing multiple processes, changing process priority with nice, scheduling of processes at command, batch commands, kill, ps, who, sleep, Handling editors (vi/ed editors).

UNIT 3 ***(9L)***

Unix Shell programming: Types of Shells, Shell Meta characters, Shell variables, Shell scripts, Shell commands, the environment, Integer arithmetic and string Manipulation, Special command line characters, Decision making and Loop control, controlling terminal input, trapping signals, arrays. Processes in Unix/Linux, Filters using regular expressions: grep and sed, UNIX system administration.

Suggested Books:

1. Sumitabh Das, "Unix Concepts and applications", TMH, 2003
2. *Mike Joy, Stephen Jarvis, Michael Luck, "Introducing Unix and Linux", Palgrave Macmillan.*
3. O'Reilly Media " Linux System Administration"

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Probability and Random Variables**	Course Code: **JA5010**
Credit: 3.5	L **3** T **1** P **0**
Year: **3rd**	Semester: **V**

UNIT – 1 **(8L)**

Theory of Probability

Definition of Probability; Types of Probability; Classical Probability; Odds in favour and Odds against an event; Axioms of probability; Conditional probability; Dependent and Independent events; Bayes' theorem.

UNIT – 2 **(8L)**

Random Variable

Random variables; Probability Distribution function; Probability Mass function; Continuo Distribution; Conditional Distribution; Mathematical Expectation of a Discrete Random Variable and Continuous Random Variable.

UNIT – 3 **(8L)**

Statistical Techniques

Moment; Moment Generating function; Mean and Variance; Skewness; Kurtosis; Correlation and Regression Analysis; Binomial and Poisson Distributions.

UNIT – 4 **(8L)**

Discrete Random Variable and their Distributions

Binomial Negative Distribution, Binomial Hyper Geometric and Multinomial Distributions, Poisson Distribution, Relationship between Distributions of various Discrete Random Variables.

UNIT V: **(8L)**

Continuous Random Variable and their Distributions

Normal log Distribution; Normal Distribution; Normal Multivariate Distribution; Gamma Exponential; Chi-square; Weibull and Ray-Leigh Distributions; Relationship between Distributions of various continuous Random Variables.

Text Books:

1. Probability Theory and Stochastic Process, Prabhakar Rao and TSR Murty, Hyd., Reference Learning, 2013.
2. Fundamentals of Mathematical Statistics, S.C. Gupta and V.K. Kapoor, S. Chand and Co, 2000.

Reference Books:

1. Probability, Random variables and Stochastic Process, Athanasios, Papoulis, McGraw Hill, 2nd edition, 1984.
2. Probability and Statistics with Reliability, Queuing and Computer Science Application, Kishor S. Trivedi, Willey, 2nd edition, 2001.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Multimedia Technologies**	Course Code: **IA5010**
Credit:3.5	L **3** T **1** P **0**
Year: **3rd**	Semester: **V**

UNIT 1 ***(8L)***

Introduction: Introduction to Multimedia, Multimedia Information, Multimedia Objects, Multimedia in business and work, Stages of Multimedia Projects, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools.

UNIT 2 ***(8L)***

Multimedia Building Blocks: Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture.

UNIT 3 ***(8L)***

Data Compression: Introduction to data compression, Compression ratio, loss less &lossy compression, Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, Adaptive Coding, Arithmetic Coding ,Finite Context Modelling, Dictionary based Compression, Sliding Window Compression, LZ77,LZ78, LZW compression.

UNIT 4 ***(8L)***

Image, Audio and Video Compression: Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression, lossy graphic compression, image file formatic animations Images standards, JPEG Compression, ZigZag Coding, Multimedia Database. Content based retrieval for text and images, Video Compression, MPEG standards, MHEG Standard Video Streaming on net.

UNIT 5 ***(8L)***

Advanced forms of interaction in Multimedia: Video Conferencing, Elements of (immersive/non-immersive) Virtual Reality, Augmented Reality, Telepresence, Mobile technologies **Multimedia Security:** Overview- Multimedia Systems, Secured Multimedia, Digital Rights Management Systems and Technical trends, Multimedia Encryption and Digital Watermarking, Security Attacks and Multimedia Authentication.

SUGGESTED BOOKS:

1. Tay Vaughan "Multimedia, Making IT Work" Osborne McGraw Hill.
2. Buford "Multimedia Systems" Addison Wesley.
3. Mark Nelson "Data Compression Book" BPB.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Artificial Intelligence**	Course Code: **DA5230**
Credit:3.5	L **3** T **0** P **2**
Year: **3rd**	Semester: **V**

UNIT 1 ***(8L)***

Introduction: History of AI, Intelligent agents – Structure of agents and its functions, Problem spaces and search - Heuristic Search techniques – Best-first search, Problem reduction -Constraint satisfaction - Means Ends Analysis.

UNIT 2 ***(8L)***

Knowledge Representation: Approaches and issues in knowledge representation, Knowledge Based Agent, Propositional Logic, Predicate logic – Unification – Resolution, Weak slot – filler structure, Strong slot - filler structure.

UNIT 3 ***(8L)***

Reasoning under uncertainty: Logics of non-monotonic reasoning, Implementation, Basic probability notation, Bayes rule, Certainty factors and rule based systems, Bayesian networks, Dempster - Shafer Theory, Fuzzy Logic.

UNIT 4 ***(8L)***

Planning and Learning: Planning with state space search, conditional planning, continuous planning, Multi-Agent planning. Forms of learning - inductive learning – Reinforcement Learning - learning decision trees - Neural Net learning and Genetic learning

UNIT 5 ***(8L)***

Advanced Topics: Game Playing: Minimax search procedure - Adding alpha-beta cutoffs. **Expert System:** Representation - Expert System shells - Knowledge Acquisition. CASE STUDY- Dendral, Mycin. **Swarm Intelligent Systems** – Ant Colony System, Development, Application and Working of Ant Colony System.

Text Books:

1. Elaine Rich, Kevin Knight and Shivashankar B.Nair, “Artificial Intelligence”, Tata McGraw-Hill, Third edition, 2009. (UNITs I, II, III & V)
2. Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education Asia, Second edition, 2003. (UNIT IV)
3. N. P. Padhy, “Artificial Intelligence and Intelligent System”, Oxford University Press, Second edition, 2005. (UNIT V)

Reference Books:

1. Rajendra Akerkar, “Introduction to Artificial Intelligence”, Prentice-Hall of India, 2005.
2. Patrick Henry Winston, “Artificial Intelligence”, Pearson Education Inc., Third edition, 2001.
3. Eugene Charniak and Drew Mc Dermott, “Introduction to Artificial Intelligence", Addison-Wesley, ISE Reprint, 1998.
4. Nils J.Nilsson, “Artificial Intelligence - A New Synthesis", Harcourt Asia Pvt. Ltd., Morgan Kaufmann, 1988.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Principles of Management**	Course Code: **HA5010**
Credit:2	L **2** T **0** P **0**
Year: **3rd**	Semester: **V**

UNIT – I **5L**

Overview of management: Definition of management, need for management, role of managers, Management as science and art, evolution of management thought, contribution of Taylor and Fayol, Types of business organizations, Levels of management

UNIT – II **9L**

Planning: Definition of planning, steps involved in planning, types of planning, objectives, process of managing by objectives, Strategy, types of strategies, Policy, types of policies, Decision making, types of decision making process.

UNIT – III **10L**

Organizing: Nature, purpose and structure of organization, formal and informal organization, Departmentation, its importance, basis of departmentation, Line and staff authority, Centralization and decentralization, Authority and responsibility, delegation of authority

Selection and recruitment, orientation, appraisal, HRD.

UNIT – IV **8L**

Directing: Creativity and innovation, Motivation, hierarachy of needs, motivation theories, Leadership – definition, elements, styles, leadership theories

Organization culture, elements and types of culture, managing cultural diversity.

UNIT – V **8L**

Controlling: System and process of controlling, requirements of effective control, Types of control, cost control, purchase control, maintenance control, quality control, planning operations

Globalization and liberalization.

Reference Books:

1. Charles W. L. Hill and Steven McShane, "Principles of Management", McGraw Hill Education, Special Indian edition, 2007.
2. R. N. Gupta, "Principles of Management ", S Chand Limited, 2007.
3. P. C. Tripathy and P. N. Reddy, " Principles and Practices of Management", Tata McGraw Hill, 1999
4. Joseph L. Massie, "Essentials of Management" , Prentice Hall of India, 2003.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Algorithms: Analysis & Design**	Course Code: **DA5210**
Credit:4	L **3** T **0** P **2**
Year: **3rd**	Semester: **V**

UNIT 1 ***(7L)***

Introduction: Algorithms, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, Probabilistic analysis.

UNIT 2 ***(8L)***

Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication. **Greedy method:** General method, applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

UNIT 3 ***(8L)***

Transform and conquer , Presorting , Balanced Search trees , AVL Trees , Warshall's and Floyd's Algorithm , Optimal Binary Search trees , Greedy Techniques , Prim's Algorithm , Kruskal's Algorithm Dijkstra's Algorithm , Huffman trees.

UNIT 4 ***(10L)***

Backtracking: N-Queen's Problem, Hamiltonian Circuit problem, Subset-Sum problem, Branch and bound , Assignment problem , Knapsack problem ,Traveling salesman problem.

UNIT 5 ***(7L)***

NP-Hard and NP-Complete problems: Basic concepts, non deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem.

SUGGESTED BOOKS

Text Books:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, SatrajSahniand Rajasekharam, Galgotia publications pvt. Ltd.
2. AnanyLevitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia,2003 3.
3. Algorithm Design: Foundations, Analysis and Internet examples, M.T.Goodrich and R.Tomassia, Johnwiley and sons.

Reference Books:

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, "Introduction to Algorithms", PHI Pvt. Ltd., 20012.
2. Introduction to Design and Analysis of Algorithms A strategic approach, R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, McGraw Hill.
3. Design and Analysis of algorithms, Aho, Ullman and Hopcroft,Pearson education.
4. Algorithms – Richard Johnson baugh and Marcus Schaefer, Pearson Education.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Advanced Java Programming**	Course Code: **DA5220**
Credit:4	L **3** T **0** P **2**
Year: **3rd**	Semester: **V**

UNIT 1 ***(8L)***

J2SE: Concepts and Prerequisites: Data Types, Arrays, Dynamic Arrays, Type Casting, Classes and Objects, Inheritance, Interfaces, Exception Handling, Multi-Threading.

J2EE Architecture: J2EE as a framework, Client Server Traditional model, Comparison amongst 2-tier, 3-tier and N-tier architectures.

UNIT 2 ***(8L)***

JDBC: Introduction, JDBC Architecture, Types of JDBC Drivers, The Connectivity Model, The java.sql package, Navigating the Result Set object's contents, Manipulating records of a Result Set object through User Interface , The JDBC Exception classes, Database Connectivity, Data Manipulation (using Prepared Statements, Joins, Transactions, Stored Procedures), Data navigation.

UNIT 3 ***(8L)***

Java Beans: The software component assembly model- The java beans development kit- developing beans – notable beans – using info bus - Glasgow developments - Application Builder tool- JAR files- Introspection-Bound Properties-Persistence-customizers - java beans API.

EJB: EJB architecture- EJB requirements – design and implementation – EJB session beans- EJB entity beans-EJB Clients – deployment tips, tricks and traps for building distributed and other systems – implementation and future directions of EJB-Variable in perl- perl control structures and operators – functions and scope.

UNIT 4 ***(8L)***

Java Servlet: Servlet overview, Brief origin and advantages over CGI, Writing small Servlet Programs, Deployment Descriptor, Servlet Life Cycle, Sharing Information, Initializing a Servlet, Writing Service Methods, Filtering Requests and Responses, Invoking Other Web Resources, Accessing the Web Context, Maintaining Client State, Finalizing a Servlet, Session: Definition, Different ways to track sessions

UNIT 5 ***(8L)***

JSP: Introduction to JSP, JSP processing, JSP Application Design, Tomcat Server, Implicit JSP objects, Conditional Processing, Declaring variables and methods, Error Handling and Debugging, Sharing data between JSP pages- Sharing Session and Application Data. Accessing a database from a JSP page, Application-specific Database Action, Developing Java Beans in a JSP page, introduction to Struts framework.

Text Books:

1. J. McGovern, R. Adatia,Y. Fain, 2003, J2EE 1.4 Bible, Wiley-dream tech India Pvt. Ltd, New Delhi.
2. H. Schildt, 2002, Java 2 Complete Reference, 5th Edition, Tata McGraw-Hill, New Delhi.

Reference Books:

1. K. Moss, 1999, Java Servlets, Second edition, Tata McGraw Hill, New Delhi.
2. D. R. Callaway, 1999, Inside Servlets, Addison Wesley, Boston.
3. Joseph O'Neil, 1998, Java Beans from the Ground Up, Tata McGraw Hill, New Delhi.
4. Tom Valesky, Enterprise JavaBeans, Addison Wesley.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Software Engineering**			Course Code: **DA6010**
Credit: 3	L **3**	T **0**	P **0**
Year: **3rd**			Semester: **VI**

UNIT 1 ***(8L)***

Introduction to Software Engineering, Software Characteristics, Software Crisis, Software Engineering Processes, Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

UNIT 2 ***(8L)***

Software Requirement Analysis and Specifications: Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Data Flow Diagrams, Data Dictionaries, Entity-Relationship diagrams, Software Requirement and Specifications, Functional and non-Functional requirements, Software Prototyping, Feasibility Study, Information Modeling, Decision Tables, SRS Document, IEEE Standards for SRS, Software Quality Assurance (SQA),SEI-CMM Model.

UNIT 3 ***(8L)***

Design: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead‟s Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

UNIT 4 ***(7L)***

Software Reliability: Failure and Faults, Reliability Models: Basic Model, Logarithmic Poisson Model, Calender time Component, Reliability Allocation. **Coding:** Top-Down and Bottom –Up programming, structured programming, Compliance with Design and Coding Standards.

UNIT 5 ***(9L)***

Testing: Objectives, Testing Tools & Standards. Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Path Testing, Structural Testing (White Box Testing), Functional Testing (Black Box Testing),

Maintenance: Corrective and Perfective Maintenance, Maintenance Process, Maintenance Models, Maintenance Cost, Software Re-Engineering, Reverse Engineering. Constructive Cost Models (COCOMO).

Software Quality Management: Software Quality Factors, Quality Assurance, Quality Standards, Software Maintenance.

Text Books:

3. R. S. Pressman, “Software Engineering – A practitioner’s approach”, 3rd ed., McGraw Hill Int. Ed., 1992.
4. K.K. Aggarwal &Yogesh Singh, “Software Engineering”, New Age International, 2001
5. PankajJalote, Software Engineering, Wiley India

Reference Books:

1. Rajib Mall, Fundamentals of Software Engineering, PHI Publication, 3rd Edition.
2. Ian Sommerville, Software Engineering, Addison Wesley, 8th Edition.
3. James Peter, W Pedrycz, “Software Engineering”, John Wiley & Sons

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Data Warehousing and Data Mining**	Course Code: **DA6020**
Credit:3.5	L **3** T **1** P **0**
Year: **3rd**	Semester: **VI**

UNIT 1 ***(12L)***

Overview, Motivation (for Data Mining), Data Mining-Definition & Functionalities. **Data Warehousing:** Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi-Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting. ROLAP, MOLAP, HOLAP.

UNIT 2 ***(7L)***

Data Pre-Processing: Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Inconsistent Data, Data Integration and Transformation. Data Reduction: Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation.

UNIT 3 ***(7L)***

Concept Description: Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases

UNIT 4 ***(6L)***

Classification: What is Classification, Issues regarding Classification, Decision tree, Bayesian Classification, Classification by Back propagation.

UNIT 5 ***(8L)***

Cluster Analysis: Data types in cluster analysis, Partitioning methods. Hierarchical Clustering- CURE and Chameleon, Density Based Methods-DBSCAN, OPTICS, Grid Based Methods- STING, CLIQUE, Outlier Analysis.

Suggested Books:

1. Jiawei Han, MichelineKamber, ”Data Mining Concepts & Techniques” Elsevier
2. M.H.Dunham,”DataMining:Introductory and Advanced Topics” Pearson Education
3. Mallach,”Data Warehousing System”,McGraw –Hill

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Introduction to System Software**	Course Code: **IA6020**
Credit:3	L **3** T **0** P **0**
Year: **3rd**	Semester: **VI**

UNIT-I
Assemblers: General design procedures, Design of single pass and two pass assemblers, Macro Processors – Features of a macro facility,(macro instruction arguments, conditional macro expansion, macro calls within macros), Implementation of a restricted facility : A two pass algorithm; Macro Assemblers.

UNIT-II
Loader schemes: Compile and go loaders, absolute loaders, relocating loader, Linking, Reallocation- static & dynamic linking, Direct linking loaders, Binders, Overlays, dynamic binders; Working principle of Editors, Debuggers.
Compilers: Overview of compilation process, lexical analysis, syntax analysis, semantic analysis and intermediate code generation and code optimization techniques.

UNIT-III
Microprocessor: Introduction to 8085, CPU architecture-register organization, Pin description and features, different addressing modes and their features

UNIT-IV
Instruction Set: Instruction set and assembly language programming, Instruction cycle, machine cycle, Timing diagram.

UNIT-V
Interfacing: Interfacing memory, peripheral chips (IO mapped IO & Memory mapped IO), Interrupts and DMA.

Text Books:

1. John J Donovan ,"Systems Programming", 10/e, McGraw-Hill Edition ,USA,2010,
2. R.S Goankar, "Microprocessor architecture, programming and application with the 8085",5/e, Pen Ram International, India, 2011

Reference Books :

1. Aho and Ulman,"PrinciplesofCompilers",2/e,Narosa Publishing House, India New Delhi,2006

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Engineering Economics**	Course Code: **GC5010**
Credit: 2	L **2** T **0** P **0**
Year: **3rd**	Semester: **VI**

UNIT-I

Time value of money: Simple and compound interest, Time value equivalence, Compound interest factors, Cash flow diagrams, Calculation, Calculation of time –value equivalences. Present worth comparisons, Comparisons of assets with equal, unequal and infinite lives, comparison of deferred investments, Future worth comparison, payback period comparison.

UNIT-II

Use and situations for equivalent annual worth comparison, Comparison of assets of equal and unequal life. Rate of return, Internal rate of return, comparison of IIR with other methods, IRR misconceptions.

UNIT-III

Analysis of public Projects: Benefit/ Cost analysis, quantification of project, cost and benefits, benefit/ cost applications, Cost –effectiveness analysis.

UNIT-IV

Depreciation, computing depreciation charges, after tax economic comparison, Break-even analysis; linear and non-linear models. Product and Process Costing, Standard Costing, cost estimation, Relevant Cost for decision making, Cost control and Cost reduction techniques.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Computer Graphics**			Course Code: **DA6210**
Credit: 4	L **3**	T **0**	P **2**
Year: **3rd**			Semester: **VI**

UNIT 1 ***(7L)***

Introduction to computer graphics and primitives algorithms: Points, planes, pixels and frames buffers, lines, circles and ellipse drawing algorithms, display devices, primitive devices, applications of computer graphics.

UNIT 2 ***(7L)***

Two-Dimensional Transformation: Introduction to transformation matrix, **Types of transformations in 2-D:** Identity Transformation, Scaling, Reflection, Shear Transformation, Rotation, Translation, Rotation about an arbitrary point, Combined Transformation, Homogeneous coordinates, 2-D transformation using homogeneous coordinates.

UNIT 3 ***(9L)***

Three-Dimensional Transformation: Objects in homogeneous coordinates, **3-D Transformation:** Scaling, Translation, Rotation, Shear Transformations, Reflection, world coordinates and viewing coordinates, Projection, parallel Projection, Perspective projection. **Hidden Lines and Surfaces:** Back face removal algorithms, Hidden lines methods.

UNIT 4 ***(9L)***

Viewing and Solid Area Scan-Conversion: Introduction to viewing and clipping, viewing transformation in 2-D, Point Clipping, Line Clipping, Introduction to polygon Clipping, Viewing and clipping in 3-D, Three Dimensional Viewing Transformations, Text Clipping, generalize Clipping, Multiple windowing.

Introduction to Solid Area Scan: Conversion, Inside-Outside Test, Winding Number Method and Coherence Property, Polygon Filling, Seed Fill Algorithms, Scan Line Algorithm, priority Algorithm, Scan Conversion of Characters, Aliasing, Anti-aliasing, Halfoning, Threshold and Dithering.

UNIT 5 ***(8L)***

Introduction to curves: Curves Continuity, Conic Curves, Piecewise Curve Design, Spline curve representation, Bezier Curves, Fractals and its Applications.

Object rendering: Introduction to Object Rendering, Shading, Ray Tracing, Illuminational model, Colour Models.

Text Books:

1. Computer Graphics, R.K. Maurya, John Willey.
2. Procedural Elements of Computer Graphics, David F. Rogers, Tata McGraw Hill.

Reference Books:

1. Computer Graphics, Donald hearn and M.Pauline Beaker, Prentice Hall of India.
2. Computer Graphics, Steven Harrington, McGraw Hill.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Dot Net Technologies**	Course Code: **DA6220**
Credit: 4	L **3** T **0** P **2**
Year: **3rd**	Semester: **VI**

UNIT 1 ***(8L)***

Introduction to C#: C# Language Fundamentals: An Anatomy of a basic class, Creating objects: Constructor basic, the composition of an application, Default Assignment and variable scope, member initialization syntax, Basic input and output with the console class, Understanding value types and reference types, the master node: System. Objects, The system Data type (And C# aliases), Converting between value type and reference type: Boxing and Unboxing, Defining program constraints, Iterations constructs, control flow constructs, The complete set operator, Defining Custom class methods, Understanding static methods, Method parameter modifiers, Array manipulation, String manipulation, Enumerations, Defining structures, Defining custom namespaces.

UNIT 2 ***(8L)***

Object Oriented Aspects Of C#: Formal definition of the class, Definition the "Default public interface" of a type, Recapping the pillars of OOP, The first pillar: Encapsulation services, Pseudo Encapsulation: Creating read only field, The second pillar: Inheritance supports keeping family secrets: The "Protected" keyword, The Nested type definitions, The third pillar: Polymorphic support casting between types, Generating class definitions using Visual Studio.Net. Exceptions and Objects Life Time Ode to errors, Bugs and exceptions, the role of .NET exceptions handling, the system. Exception base class throwing a generic exception catching exception, CLR system level exception(System. system exception), Custom application level exception (System. application exception), Handling multiple exception, The finally block The last chance exception, dynamically identify application and system level exception, Debugging system exception using VS.Net, Understanding Object life time, The CIT of new, The basic of garbage collection, Finalizing a type, Finalization process, building and Ad hoc destruction method, garbage collection optimization, The system .GC type.

UNIT 3 ***(8L)***

The Clr And The .Net Framework: The building Block of the .NET platform (CLR,CTS,CLS), the role of the .NET base class libraries, , additional .NET Aware programming Languages, Understanding .Net Assembles, Problems with classic COM Binaries, The role of the common intermediate language, The role of .NET type metadata, The role of the assembly manifest, Compiling CIL to platform specific instruction. Building a simple file test assembly, Cross Language Inheritance. Building the multi file assembly, Using the multi file assembly, Understanding private assemblies, robing for private assemblies (The Basics), Private assemblies and XML Configuration files, Probing for private assemblies (The details),Understanding Shared assembly, Understanding Shared Names, Building a shared assembly, Understanding delay Signing, Installing/Removing shared assemblies, Using a Shared assembly.

UNIT 4 ***(8L)***

Application Development On .Net: Using the visual studio.Net IDE, key aspects of the VS.Net IDE, Documenting source code via XML, Building Windows Applications, Event Driven Programming, Delegate, Event and its association, Synchronous and asynchronous operation with delegate, User Defined events and delegates,ADO.NET Architecture,.NET Framework Data Providers, Data set, Data reader, data adapter, Accessing Data with ADO.NET.

UNIT 5 ***(8L)***

Web Based Application Development On .Net: Introduction to web form, Need of Web Application, Static and Dynamic Page, Working of IIS and Browser, Differences between ASP and ASP.NET, understanding post back, understanding page life cycle, State management, Server control form validation, Master pages, ASP.NET web security, server control form validation, Programming Web Applications with Web Forms, Web service, Programming Web Services.

Text Books:

1. E. Balagurusamy, "Programming in C#", Tata McGraw-Hill, 2004. (Unit I, II)
2. J. Liberty, "Programming C#", 2nd ed., O'Reilly, 2002. (Unit III, IV, V)

Reference Books:

1. Herbert Schildt, "The Complete Reference: C#", Tata McGraw-Hill, 2004.
2. Robinson et al, "Professional C#", 2nd ed., Wrox Press, 2002.
3. Andrew Troelsen, "C# and the .NET Platform", A! Press, 2003.

S. ThamaraiSelvi, R. Murugesan, "A Textbook on C#", Pearson Education, 2003.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Cloud Computing**			Course Code: **IA7211**
Credit: 4	L **3**	T **0**	P **2**
Year: **4th**			Semester: **VII**

UNIT 1 ***(10L)***

Cloud Computing – History of Cloud Computing – Cloud Architecture – Cloud Storage – Why Cloud Computing Matters – Advantages of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud Today – Cloud Services.

UNIT 2 ***(10L)***

Web-Based Application –Types of Cloud Service Development – Software as a Service – Platform as a Service – Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools – Amazon Ec2 – Google App Engine – IBM Clouds

UNIT 3 ***(10L)***

Centralizing Email Communications– Cloud Computing for the Community –Collaborating on Group Projects and Events – Cloud Computing for the Corporation--Evaluating web mail services--Evaluating web conference tools--Evaluating on line groupware--collaborating via blogs and wikis

UNIT 4 ***(10L)***

Understanding cloud storage--evaluating on linefile storage-- exploring on line book marking services--exploring on line photo editing applications--exploring photo sharing communities--controlling it with web based desktops.

Suggested Books:

1. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, August 2008.
2. Haley Beard, Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.
3. Anthony T Velte , Robert Elsenpeter Cloud Computing A Practical Approach , Tata McGraw-Hill Education, 01-Jan-2009.
4. Lee Gilliam, Cloud Computing Principles, Systems and Applications , Springer, 2010.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **ADVANCED WEB TECHNOLOGY**		Course Code: **IA7220**
Credit: 3.5	L T P **3 0 2**	
Year: **4th**		Semester: **VII**

Unit 1: Revised tour of basics: HTML with CSS, sample codes in java script, introduction to XML with CSS, working with images, revision of mysql installation and commands.
Unit 2: Web development and Bootstrap: Introduction to bootstrap, history of bootstrap, responsive website, usage of bootstrap, first webpage with bootstrap Bootstrap controls – buttons, table, images, button groups, dropdown, collapse, tabs, forms etc.
UNIT 3: Ruby Introduction: what is ruby?, brief history of ruby, ruby on rails download and installation, first program in ruby, ruby variables and data types- numbers, Boolean, strings etc., puts and print, String functions: length, reverse, upcase, downcase etc., writing comments.
UNIT 4: Ruby on rails: introduction to rails, installation of DBMS, writing test application for database connections, starting rails web server and open application, sample website project on rails.
*UNIT 5: **Android Application Development:** introduction to android, download and installation of android studio, understand the structure of hello project, design sample app in SDK, configuration and launching of emulator, load application using mobile phone, introduction to sqllite.*

SUGGESTED BOOKS:

1. *Michael Hartl, Ruby on rails tutorial (rails 5) learn web development with rails, ed 4, online*
2. Head First Android Development A Brain-Friendly Guide By Dawn Griffiths, David Griffiths Publisher: O'Reilly Media , 2015
3. Programming Ruby 1.9 & 2.0: The Pragmatic Programmers' Guide (The Facets of Ruby) 4th Edition by Dave Thomas (Author), Andy Hunt (Author), Chad Fowler (Author)

Laboratory Work:

- Design bordered table for storing details of all employees in IT department using bootstrap. Also highlight HOD of department.
- Insert an image in the webpage in different shapes like circle, rectangle etc.
- Design login form using bootstrap classes.
- Design one page web poster of your project using bootstrap.
- Downloading and installation of ruby on rails.
- Create a module for simple calculator function.
- Write a program to calculate factorial of a no using ruby.
- Write first database application using rails and map the web server.
- Develop your own website by using bootstrap and rails.
- Create some basic android applications like: working with button, ToggleButton, checkbox, date-time picker, AlertDialog box etc.
- Create a MediaPlayer application in android using the above concepts.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **BUSINESS INTELLIGENCE**	Course Code: **DA8010**
Credit: **3.5**	L T P **3 1 0**
Year: **4th**	Semester: **VIII**

Unit I

Introduction to Business Intelligence,

Introduction to OLTP and OLAP, BI Definitions & Concepts, Business Applications of BI, BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities

Unit II

Basics of Data Integration (**E**xtraction **T**ransformation **L**oading)**,**

Concepts of data integration need and advantages of using data integration, introduction to common data integration approaches, introduction to ETL using SSIS, Introduction to data quality, data profiling concepts and application

Unit III

Introduction to Multi-Dimensional Data Modeling**,**

Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi dimensional modeling, concepts of dimensions, facts, cubes, attribute, hierarchies,

Unit IV

Star and snowflake schema, introduction to business metrics and KPIs, creating cubes using SSAS

Unit V

Basics of Enterprise Reporting**,**

Introduction to enterprise reporting, concepts of dashboards, balanced scorecards, introduction to SSRS Architecture, enterprise reporting using SSRS

Text Book:

1. David Loshin ,Business Intelligence.
2. Mike Biere ,Business intelligence for the enterprise .
3. Larissa Terpeluk Moss, Shaku Atre ,Business intelligence roadmap.

Reference Book:

1. Cindi Howson ,Successful Business Intelligence: Secrets to making Killer BI Applications .
2. Brain, Larson ,Delivering business intelligence with Microsoft SQL server 2008 .

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Mobile Computing**	Course Code: **DA6640**
Credit: **3**	L T P **3 0 0**
Year: **3rd**	Semester: **VI**

Unit I

Introduction: Introduction to mobile computing. Convergence of Internet, digital communication and computer networks. Sharing of wireless channels: FDMA, TDMA, CDMA. MAC layer issues in wireless communication

Unit II

Mobility Management: Impacts of mobility and portability in computational model and algorithms for mobile environment. Disconnected operation, handling handoffs. Analysis of algorithms and termination detection.Types of Mobility. Mobility in cellular based wireless network: channel allocation, interferences, handoffs and location management. IP mobility: Mobile IP and IDMP

Unit III

Wireless LAN: Infrared vs. Radio transmission, Infrastructure and Ad hoc Networks, IEEE 802.11: System architecture, Protocol architecture, Physical layer, Medium access control layer, MAC management, Future development; HIPERLAN: Protocol architecture, Physical layer, Channel access control.Sub layer, Medium access control Sub layer, Information bases and Networking; Bluetooth: User scenarios, Physical layer, MAC layer, Networking. Security, Link management. Personal Area Network: Bluetooth and ZigBee. Network layer issues ad hoc and sensor networks

Unit IV

Data Models: Data delivery models: push and pull. Data dissemination in wireless channels. Broadcast disks. Effects of caching,Indexing in Air, Mobile Databases and transaction

Unit V

Distributed Mobile Environment: Distributed file system for mobile environment, Mobile Middleware: Service discovery, adaptation, mobile agents.

Text Book:

1. Schiller, “Mobile Communications”, PHI/Pearson Education, Second Edition.
2. William Stallings, “Wireless Communications and Networks”, PHI/Pearson Education.

Reference Book:

1. T. Rappaport, "Wireless Communication: Principles and Practice", Pearson Education.
2. Reza B'Far (Ed), "Mobile Computing Principles", Cambridge University Press.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **E-Business Applications** (Elective – I)	Course Code: **IA7630**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VII**

UNIT 1 ***(12L)***

Overview of e-Business, World Wide Web, Overview of Electronics payments, Home Banking, Online Banking. Customer Relation Management (CRM): Why CRM? Defining CRM, New CRM architecture, CRM trends. Selling-Chain Management: Deriving forces for Selling-Chain management, Selling-Chain management, Elements of Selling-Chain infrastructure.

UNIT 2 ***(5L)***

Enterprise Resource Planning (ERP): What is ERP? Why ERP? ERP usage in the real World, ERP implementation, Future of ERP applications.

UNIT 3 ***(5L)***

Supply Chain Management (SCM): Defining SCM, Basics of Internet-Enabled SCM, e-Supply chain fusion, Manager's roadmap for SCM.

UNIT 4 ***(5L)***

E-Procurement: Purchasing versus procurement, Elements of Buy-Side e-Procurement solutions, Elements of Sell-Side e-Procurement solutions, Manager's roadmap for e-Procurement.

UNIT 5 ***(13L)***

Knowledge-Tone Applications: Why knowledge applications and what is it? Developing the e-Business Design: Challenges of e-Business strategy creation, Roadmap to moving your company into e-Business. Maturity Models: Five Maturity Levels, Characteristics of Maturity Levels, Key process areas. Overview of E-business proposal, calculating ROI (return on investment).

Suggested Books:

1. Ravi Kalakota and Marcia Robinson; e-Business- Roadmap for Success**;** Addison-Wesley Longman Publishing Co., Inc, 2001
2. H. Albert Napier, Philip J. Judd, Ollie Rivers, Stuart W. Wagner; Creating a Winning E-Business; Thompson, Course Technology; Edition 2 , 2007.
3. Greenstein and Feinman, "E-Commerce", TMH
4. Ravi Kalakota, Andrew Whinston, "Frontiers of Electronic Commerce", Addision Wesley
5. Denieal Amor, "The E-Business Revolution", Addision Wesley

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Introduction to Big data** (Elective – I)	Course Code: **IA7640**		
Credit: 3.5	L **3**	T **1**	P **0**
Year: **4th**	Semester: **VII**		

UNIT I – INTRODUCTION TO DATA SCIENCE (7 hours)
Data science process – roles, stages in data science project – working with data from files – working with relational databases – exploring data – managing data – cleaning and sampling for modelling and validation – introduction to NoSQL.

UNIT II – MODELING METHODS (9 hours)
Choosing and evaluating models – mapping problems to machine learning, evaluating clustering models, validating models – cluster analysis – K-means algorithm, Naïve Bayes – Memorization Methods – Linear and logistic regression – unsupervised methods. Introduction of big data analytics tools with few lectures/tutorial in practical mode.

UNIT III – INTRODUCTION TO R (8 hours)
Reading and getting data into R – ordered and unordered factors – arrays and matrices – lists and data frames – reading data from files – probability distributions – statistical models in R - manipulating objects – data distribution with few lectures/tutorials in practical mode.
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UNIT IV – MAP REDUCE (8 hours)
Introduction – distributed file system – algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce – Hadoop - Understanding the Map Reduce architecture - Writing Hadoop Map Reduce Programs - Loading data into HDFS - Executing the Map phase - Shuffling and sorting - Reducing phase execution with few lectures/tutorials in practical mode..

UNIT V- DELIVERING RESULTS (8 hours)
Documentation and deployment – producing effective presentations – Introduction to graphical analysis – plot() function – displaying multivariate data – matrix plots – multiple plots in one window - exporting graph - using graphics parameters with few lectures/tutorials in practical mode..

REFERENCES

1. Nina Zumel, John Mount, “Practical Data Science with R”, Manning Publications, 2014.

2. Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2014.

3. Mark Gardener, “Beginning R - The Statistical Programming Language”, John Wiley & Sons, Inc., 2012.

4. W. N. Venables, D. M. Smith and the R Core Team, “An Introduction to R”, 2013.

5. Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Dasgupta, “Practical Data Science Cookbook”, Packt Publishing Ltd., 2014.

6. Nathan Yau, “Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics”, Wiley, 2011.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Soft Computing**	Course Code: **DA8020**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VIII**

UNIT 1 (8L)

Introduction of Soft Computing: Introduction to soft computing techniques, Basic concepts offuzzy logic, Artificial neural networks, Genetic algorithm and probabilistic reasoning,application areas of soft computing techniques. **Artificial Neural Networks:** Basic concepts -Single layer perception - Multilayer Perception - Supervised and Unsupervised learning – Backpropagation networks - Kohnen'sself organizing networks - Hopfield network.

UNIT 2 (8L)

Fuzzy Systems: Fuzzy sets, Fuzzy Relations and Fuzzy reasoning, Fuzzy functions -Decomposition – Fuzzy automata and languages - Fuzzy control methods - Fuzzy decisionmaking.

UNIT 3 (8L)

Neuro - Fuzzy Modeling: Adaptive networks based Fuzzy interface systems - Classification andRegression Trees – Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls – Simulated annealing – Evolutionary computation.

UNIT 4 (8L)

Genetic Algorithms: Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction – Rank method - Rank space method.

UNIT 5 (8L)

Application of Soft Computing: Optimization of traveling salesman problem using GeneticAlgorithm, Genetic algorithm based Internet Search Techniques, Soft computing based hybridfuzzy controller, Introduction to MATLAB Environment for Soft computing Techniques.

Text Books:

1. Sivanandam, Deepa, ―Principles of Soft Computing‖, Wiley
2. Jang J.S.R, Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall
3. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill
4. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall
5. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley
6. Wang, ―Fuzzy Logic‖, Springer

Reference Books:

1. Hongxing Li, C.L. Philip Chen and Han Pang Huang, Fuzzy Neural Intelligent Systems, Prentice-Hall (2010).
2. Haykin Simon, Neural Networks and Learning Machines, Imperial College Press (2012).
3. Goldberg, David E. Genetic; Algorithms in Search, Optimization and Machine Learning, Pearson Education, 2013.
4. Rosen, Kenneth H. Discrete Mathematics and its Applications, Tata Mcgraw-Hill (2014)

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Service Oriented Computing**	Course Code: **IA8620**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VIII**

UNIT 1 ***(8L)***

Introduction Service-Oriented Architecture: Computing with services, Basic standards for web services, services analysis, design, development and test, Service orchestration and composition, Resource management for web services, Quality and reliability of web services

UNIT 2 ***(8L)***

Modeling and representation: Modelling to enable interoperation, Integration vs. Interoperation, Common ontologies, Knowledge representations, Elementary algebra: relations, modeling fundamentals Resource description framework: Motivation of RDF, RDF Basics, Key Primitives, XML syntax, Storing RDF

UNIT 3 ***(8L)***

System Technology: Execution Models: Basic Interaction models, messaging, CORBA, peer to peer computing Security, trust and privacy, QoS and end-to-end performance, Web service standards, Autonomic computing, Service connection technology Grid-based web services

UNIT 4 ***(8L)***

Service-Oriented Semantic Computing: Semantic web Software agent Service discovery Ontological engineering Service evolutionary approaches, Semantic service selection, Building SOC application, Service Management

UNIT 5 ***(8L)***

Service-Oriented Challenges & Applications: Security, Challenges & Extensions, Application E-business and e-commerce M-commerce E-entertainment E-learning E-government E-health.

Suggested Books:

1. Munindar P. Singh, Michael N Hunns; Service oriented Computing, Wiley 2005
2. Huang, J.; Kowalczyk, R.; Maamar; Service-Oriented Computing: Agents, Semantics, and Engineering; Springer 2007.
3. Michael Rosen, Boris Lublinsky, Kevin T. Smith, Marc J. Balcer; Applied Soa: Service- Oriented Architecture and Design Strategies; Wiley India.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Introduction to Remote Sensing & GIS**	Course Code: **IA8630**
Credit: 3.5	L T P **3 1 0**
Year: **4th**	Semester: **VIII**

UNIT 1 ***(8L)***

Remote Sensing: Basic concepts and foundation of remote sensing – elements involved in remote sensing, electromagnetic spectrum, energy resources, energy interactions with earth surface features and atmospheres, spatial temporal , spectral and radiometric resolution of satellite sensors and satellite visual interpretation techniques.

UNIT 2 ***(6L)***

Geographical Information System: Introduction, GIS definition and terminology, components of GIS, fundamental operations of GIS, A theoretical framework for GIS.

GIS database: spatial and attribute data; conceptual models of spatial information, Raster and Vector data. Representation of geographic information: point, line and area features and topology.

UNIT 3 ***(10L)***

Raster to Vector data conversion, map projection, Remote sensing data as an input to GIS data. GIS functionality. Geospatial database: object–relational databases; data storage and data retrieval through query.

Overlay: arithmetical, logical and conditional overlay, buffer analysis.

Unit 4

Web-GIS architecture, mapping server (Geoserver and Mapserver), OGC standard services WMS, WFS, WFS-T, WCS, WPS.

UNIT 5 ***(8L)***

Applications of GIS: -

Terrain Mapping and analysis:- DEM, TIN, contouring and vertical profiling, Viewshed analysis.

Path Analysis and Network: - Shortest path, closest facility, location allocation.

SUGGESTED BOOKS:

1. Lillesand, T.M., and Kieffer, R.M., 2013: Remote Sensing and Image Interpretation, John Wiley.
2. Jensen, J.R. 2014: Remote Sensing of the Environment: An Earth resource Perspective. Prentice Hall.
3. Introduction to GIS: Kang –Tsung –Chang, TMH International, 2000.
4. Fundamentals of Spatial Information Systems by Robert laurini and Derek Thompson, Academic Press.
5. Geographical Information Systems, Vo. I and II edited by Paul Longely, M.F. Goodchild, et.al, John Wiley and Sons, Inc. 2015.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Ethical Hacking**	Course Code: **IA8640**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VIII**

UNIT 1 **(8L)**

Ethical hacking, Foot Printing- information gathering methodology, Hacking Tools, Scanning- Definition, Types of Scanning, Objectives of Scanning, Scanning Methodology, Counter measures; Enumeration- NetBios Null Sessions, Hacking tools - Enumerating User Accounts, Active Directory Enumeration and Countermeasures; System Hacking- Administrator password guessing, Password Cracking Algorithm, Automated Password Cracking, Types of Password Attacks, Hacking tools.

UNIT 2 **(8L)**

Trojans and Backdoors- Overt and Covert Channels, Indications of a Trojan Attack, Reverse Engineering Trojans, Backdoor Countermeasures; Sniffers- Working of Sniffer, Passive Sniffing, Active Sniffing, Hacking tools, Sniffing Countermeasures; Denial of Service- Goal of DoS, Impact and Modes of Attack, DoS Attack Classification, Countermeasures for Reflected DoS, Tools for Detecting DDoS Attacks.

UNIT 3 **(8L)**

Session Hijacking- Spoofing vs Hijacking, Steps in Session Hijacking, Types of Session Hijacking, Hacking Tools, Protection against Session Hijacking, IP Security; Hacking Web Servers- Popular Web Servers and Common Security Threats, Apache Vulnerability, Attack against IIS Console, Hacking Tools, Countermeasures, Increasing Web Server Security; Web Application Vulnerabilities- Web Application Hacking, Anatomy of an Attack, Web Application Threats, Carnivore, Google Hacking, Countermeasures.

UNIT 4 **(8L)**

Web Based Password Cracking Techniques- Authentication mechanisms, Password Guessing, Cookies, Password Crackers Available, Hacking Tools, Countermeasures; SQL Injection- Attacking SQL Servers, SQL Server Resolution Service (SSRS), Osql-L Probing, SQL Server Talks, Preventive Measures; Hacking Wireless Networks – Rouge Access Points, Scanning Tools, Sniffing Tools, Securing Wireless.

UNIT 5 **(8L)**

Linux Hacking – Linux Vulnerabilities, Scanning Tools, Scanning Tools, Linux Security Tools, Advanced Intrusion Detection System, Linux Security Auditing Tool; Evading Firewalls, Intrusion Detection Systems, Intrusion Detection Tools, Penetration Testing – Penetration Test vs. Vulnerability Test, Reliance on Checklists and Templates, Phases of Penetration Testing, Risk Analysis, Active Reconnaissance.

Suggested Books:

1. Manish Kumar; The Secret of Hacking; 3rd Edition; Publisher Leo Impact Security Services.
2. Ankit Fadia; An Unofficial Guide To Ethical Hacking; 2nd Edition; Macmillan India; 2006
3. Eric Cole; Hackers Beware: The Ultimate Guide To Network Security; Publisher Sams
4. Nitesh Dhanjani, Billy Rios, Brett Brett; Hacking: The Next Generation; Publisher Shroff/o'reilly (2009)
5. Shon Harris, Allen Harper, Chris Eagle, Jonathan Ness; Gray Hat Hacking: The Ethical Hacker's Handbook, Publisher: Mcgraw-hill/osborne Media (Dec 2007)

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Cyber Crime and Computer Forensics**	Course Code: **IA8651**		
Credit: 3.5	L **3**	T **1**	P **0**
Year: **4th**			Semester: **VIII**

UNIT 1 **(8L)**

Cybercrime: Definition – History and evolution Types and forms of cybercrimes -Malicious Code - Computer Viruses ,Computer Worms ,Computer Trojans, Web Hacking Foot printing, Port Scanning, E-Shoplifting Web Defacement, Denial of Service Attacks, Manipulating Cookies - Email Hacking: Email Hacking using Packet Sniffers, Email Hacking & Phishing, Email Frauds & Phishing, Email Bombing Email Hijacking - Social Engineering .

UNIT 2 **(8L)**

Cyber Crime Investigation: Best Practices for Cyber Crime Investigation: Initializing a Search and Seizure Operation Tracking & Tracing Emails, Recovery of Digital Evidence, Cyber Law: Prevention and detection of cybercrime – Cyber Policing Current statutes in India: Penalties & Offences under the Information Technology Act, Offences under the Indian Penal Code, Issues relating to investigation and adjudication of cybercrimes in India Digital evidence IT act 2000 and other legal provisions

UNIT 3 **(8L)**

Intellectual property rights: Intellectual Property Issues and Cyberspace – The Indian Perspective: Overview of Intellectual Property related Legislation in India, Copyright law & Cyberspace Trademark law & Cyberspace. Digital Delivery of Intellectual Property Services. Forensics: Basic Forensic Principles, Forensic Imaging & Verification, Data Recovery and Analysis. Types of computer forensics i.e. Media Forensics, Network forensics (internet forensics), Machine forensic, Email forensic (e-mail tracing and investigations

UNIT 4 **(8L)**

Computer Forensics Analysis: Discovery of electronic evidence - electronic document discovery, identification of data-Time keeping, forensic identification and analysis of technical surveillance devices, reconstructing fast events.Network forensics: Setting up the system, advanced network surveillance. Attackers goals: ICMP covert channelling, TCP covert channelling, HTTP. Establishing identity in cyberspace: Investigating IP address-MAC address-Tracing E-mails-E-mail address-Usernames-Nicknames and host names

UNIT 5 **(8L)**

Forensic tools and report generation: Recovery of Deleted files in windows and Unix, Analyzing network traffic, sniffers, Ethical Hacking, Hardware forensic tools like Port scanning and vulnerability assessment tools like Nmap, Netscan etc . Password recovery (tools like John the ripper, L0phtcrack, and THC-Hydra), Mobile forensic tools and analysis of called data record Template for computer forensic reports. Stages & Steps of Forensic Investigation in Tracking Cyber Criminals, Incident Handling. Footprinting, Scanning (Types-Port, Network, Vulnerability), E-Mail Spiders, Overview of System Hacking Cycle.

Suggested Books:

1. Cyber Crime and Intellectual Property Rights; Harish Chander, PHI, New Delhi.
2. Incident Response & Computer Forensics; Mandia, K. Prosise, C., Pepe, M. 2nd edition. Tata McGraw Hill, 2003.
3. McQuade, Samuel C (2005); Understanding and managing cyber crime; New Jersey: Allyn & Bacon.
4. Guide to Computer Forensics and Investigations; 2nd edition, Bill Nelson, Amelia Phillips, Frank Enfinger, and Chris Steuart, Thomson Learning
5. Derek Atkins et. al., (1997); Internet Security: Professional Reference, Techmedia, New Delhi.
6. Eric Cole; Hackers Beware: The Ultimate Guide To Network Security; Publisher Sams

References Books:

1. Digital Evidence and Computer Crime, 2nd Edition, Eoghan Casey, academic Press File System Forensic Analysis by Brian Carrier, Addition Wesley
2. Windows Forensic Analysis; DVD Toolkit (Book with DVD-ROM), Harlan Carvey, Syngress Publication
3. EnCE: The Official EnCase Certified Examiner Study Guide, 2nd Edition, Steve Bunting, Sybex Publication
4. Chad Steel, ―Windows Forensics‖, Wiley India, 2006.
5. Majid Yar, ―Cybercrime and Society‖, Sage Publications, 2006.
6. Robert M Slade, ―Software Forensics‖, Tata McGraw Hill, 2004.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Pattern Recognition**	Course Code: **IA8660**
Credit: 3.5	L T P **3 1 0**
Year: **4th**	Semester: **VIII**

Unit-I
Introduction: Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

Unit-II
Statistical Patten Recognition: Bayesian Decision Theory, Classifiers, Normal density and discriminant functions.

Unit – III
Parameter estimation methods: Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

Unit - IV
Nonparametric Techniques: Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.

Unit - V
Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.

Suggested books:

1. Richard O. Duda, Peter E. Hart and David G. Stork, “Pattern Classification”, 2nd Edition, John Wiley, 2012.
2. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2013.
3. S. Theodoridis and K. Koutroumbas, “Pattern Recognition”, 4th Edition, Academic Press, 2014.

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Knowledge Management**	Course Code: **IA8670**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VIII**

Unit -1 **(8 L)**

An Introduction to knowledge management- the foundations of knowledge management including cultural issues, technology applications, organizations concepts and processes, management aspects and decision support systems. The evolution of knowledge management from information management to knowledge management, key challenges, ethics for knowledge management.

Unit-2 **(8 L)**

Creating the culture of learning and knowledge sharing – organization and knowledge management, building the learning organization, knowledge markets- cooperation among distributed technical specialists, tacit knowledge and quality assurance.

Unit-3 **(8 L)**

Knowledge management tools- telecommunication and networks in knowledge management, internet search engines and knowledge management, information technology in support of knowledge management, knowledge management and vocabulary control, information mapping in information retrieval.

Unit-4 **(8 L)**

Knowledge Management Applications – Components of a knowledge management, case studies - from library to knowledge center, knowledge management in health sciences.

Unit -5 **(8 L)**

Future trends and case studies- Advanced topics and case studies in knowledge management, development of a knowledge management map/plan that is integrated with an organization's strategic and business plan.

SUGGESTED BOOKS:

1. Srikantaiah, T.K., M., Knowledge Management for the information Professional, Information Today, Inc, 2000.
2. D. Hislop, Knowledge Management in Organizations, Oxford University Press; Second edition (6 November 2009)
3. R.C.Agrawal, Knowledge Management Tools & Techniques , Neha Publishers and Distributors, 2009
4. Knowledge Management using Enterprise Content Management System, TCS Case Study. (http://www.tcs.com/SiteCollectionDocuments/White%20Papers/Knowledge%20Management%20using%20Enterprise%20Content%20Management%20System.pdf)
5. Nonaka, I., takeuchi, H., The Knowledge-creating company: How Japanese.
6. http://www.slideshare.net/somipam1/tata-consultancy-service

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Software Project Management**	Course Code: **IA8680**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VIII**

UNIT 1 ***(8L)***

Introduction to software project management, importance of software project management, software projects versus other projects, activities covered by software project management, plans, methods, category of software projects, success and failure of a project, management control. Project management and evaluation, project portfolio management, cost benefit evaluation techniques, risk evaluation, programme management, resource allocation within programmes, strategic programme management, benefits management.

UNIT 2 ***(8L)***

Overview of project planning, stepwise project planning, project selection, project scope identification, project infrastructure identification, project characteristics, identification of project product and activities, effort estimation, activity risks, resource allocation, review plan, lower level plan execution; selection of appropriate project approach, build or buy, selection of methodologies, choice of process models, structure versus speed of delivery, waterfall model, spiral model, software prototyping, incremental delivery, agile methods, extreme programming, iterative process management, appropriate process model selection.

UNIT 3 ***(8L)***

Software effort estimation, problems with under and over estimation, basis for software estimation, estimation techniques, bottom-up estimating, top-down and parametric models, expert judgment, estimation by analogy, COCOMO13, function point analysis; activity planning, when to plan, project schedules, sequencing and scheduling activities, network planning models, adding time dimension, forward pass, backward pass, critical path identification, activity float, project shortening, critical activity identification, activity on arrow; risk management, categories of risk, framework for risk, risk identification, risk assessment, risk planning, risk evaluation, PERT, critical chain concepts.

UNIT 4 ***(8L)***

Resource allocation, nature of resources, identification of resource requirements, scheduling resources, creating critical path, counting the cost, cost schedule, scheduling sequence; monitoring and control, creating framework, collecting data, visualizing progress, cost monitoring, earned value analysis, priority monitoring, change control; managing contracts, types of contracts, stages in contracts, terms of contracts, contract management, acceptance of contract.

UNIT 5 ***(8L)***

Managing People, understanding behaviour, organization behaviour, selecting the right person for the job, best method for instruction, motivation, Oldham-hackman job model, stress, health and safety; working in teams, becoming a team, decision making, co-ordinating dependencies, dispersed and virtual teams, communication of genres and plans, leadership; software quality, software quality in project planning, importance of software quality, ISO 9126, product versus process quality management, quality management system, process capability models, techniques to help enhance software quality, testing, quality plans.

Suggested Books:

1. Shtub, Bard, and Globerson,"Project Management: Engineering, Technology, & Implementation", Prentice Hall
2. Bob Hughes, Mike Cotterell, "Software Project Management", Tata McGraw Hill
3. Neal Whitten , "Managing Software Development Projects, Formula for Success", John Wiley & Sons

Department of Information Technology
Course Structure for B.Tech. (IT)
Batch: 2016-20

Course Title: **Information and Coding Theory**	Course Code: **IA8690**		
Credit: 3.5	L **3**	T **1**	P **0**
Year: **4th**	Semester: **VIII**		

Unit- I: Source Coding: Definitions and Examples, Uniquely Decodable Codes, Instantaneous Codes, Costructing Instantaneous Codes, Kraft's Inequality, McMillan's Inequality, Comments on Kraft's and McMillan's Inequalities. Optimal Codes: Optimality, Binary Huffman Codes, Average Word-length of Huffman Codes, Optimality of Binary Huffman Codes, r-ary Huffman Codes, Extensions of Sources.

Unit-II: Entropy: Information and Entropy, Properties of the Entropy Function, Entropy and Average Word-length, Shannon-Fano Coding, Entropy of Extensions and Products, Shannon's First Theorem, An Examples of Shannnon's First Theorem.

Unit- III: Information Channels: Notation and Definitions, The Binary Symmetric Channel, System Entropies, System Entropies for the Binary Symmetric Channel, Extension of Shannon's first Theorem to Information Channels, Mutual Information, Mutual Information for the Symmetric Channel, Channel Capacity.

Unit-IV Using an Unreliable Channel: Decision Rules, An Examples of Improved Reliability, Hamming Distance, Statement and Outline Proof of Shannon's Theorem, The Converse of Shannon's Theorem, Comments on Shannon's Theorem

Unit-V: Error- correcting Codes: Introductory Concepts, Examples of Codes, Minimum Distance, Hamming's Sphere-packing Bound, The Gilbert – Varshamov Bound, Hadamard Matrices and Codes. Linear Codes: Matrix Description of Linear Codes, Equivalence of Linear Codes, Minimum Distance of Linear Codes, The Hamming Codes, The Golay Codes, The Standard Array, Syndrome Decoding.

Text Book:

1. G.A.Jones & J.M.Jones-Information and Coding Theory, 3rd Edition, Springer Publication, New Delhi, 2013.

Reference Book: 1. R.Bose- Information Theory, Coding and Cryptography, TMH, New Delhi, 2012. 2. R.W. Hamming- Coding and Information Theory, Prentice-Hall, New Jersy, 2013.

DIT UNIVERSITY

Dehradun

Course Structure & Detailed Syllabus

of

B. Tech. in Mechanical Engineering

Batch 2016-20

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Year: 1st **Semester: I**

Course Code	Course Title	L	T	P	Credit
JA1010	Engineering Mathematics-I	3	1	0	3.5
BA1210	Engineering Chemistry	3	1	2	4.5
EA1210	Introduction to Electrical Engineering	3	1	2	4.5
FA1210	Introduction to Electronics & Communication	3	1	2	4.5
HA1210	Professional Communication-I	3	1	0	3.5
DA1210	Computer Fundamental & C Programming	3	0	2	4
LA1110	Workshop Practice	0	0	2	1
	Total				**25.5**

Year: 1st **Semester: II**

Course Code	Course Title	L	T	P	Credit
JA2010	Engineering Mathematics-II	3	1	0	3.5
OA1210	Engineering Physics	3	1	2	4.5
LA1210	Essentials of Mechanical Engineering	3	1	2	4.5
HA2210	Professional Communication-II	3	0	1	3.5
DA2210	Computer Programming in C++	3	0	2	4
BA1010	Environmental Science	2	0	0	2
LA1220	Engineering Graphics	1	0	0	1
HA1310	Soft Skills Development	0	0	2	1
	Total				**24**

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Year: 2nd **Semester: III**

Course Code	Course Title	L	T	P	Credit
LA3210	Material Science	3	1	2	4.5
LA3010	Engineering Thermodynamics	3	1	0	3.5
LA3020	Strength of Materials	3	1	0	3.5
LA3030	Manufacturing Processes I	3	0	0	3
LA3040	Kinematics of Machines	3	1	0	3.5
EA32L0	Electrical Machines	3	1	2	4.5
LA3110	Machine Drawing	0	0	2	1
	Total				**23.5**

Year: 2nd **Semester: IV**

Course Code	Course Title	L	T	P	Credit
JA3010	Engineering Mathematics III	3	1	0	3.5
LA4210	Manufacturing Processes II	3	0	2	4
LA4220	Dynamics of Machines	3	1	2	4.5
LA4230	Fluid Mechanics	3	1	2	4.5
LA4010	Energy Conversion	3	1	0	3.5
LA4020	Machine Design–I	3	1	0	3.5
LA4410	Industrial Tour	0	0	2	1
LA4Z11	Value Addition Training	0	0	2	1
	Total				**25.5**

List of Courses for Value Addition Training

Pro-E, ANSYS, Catia, Solid Works etc.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Year: 3rd **Semester: V**

Course Code	Course Title	L	T	P	Credit
LA5210	Fluid Machinery	3	1	2	4.5
LA5220	Heat & Mass Transfer	3	1	2	4.5
LA5230	Mechanical Measurements	3	1	2	4.5
LA5010	Industrial Engineering and Management	3	0	0	3
LA5020	Machine Design II	3	1	0	3.5
LA5310	Aptitude Building I	0	0	2	1
	Total				**21**

Year: 3rd **Semester: VI**

Course Code	Course Title	L	T	P	Credit
LA6210	Internal Combustion Engines	3	1	2	4.5
LA6220	Computer Aided Design (CAD)	3	1	2	4.5
LA6230	Refrigeration and Air Conditioning	3	1	2	4.5
LA6010	Operation Research	3	1	0	3.5
GC5010	Engineering Economics	2	0	0	2
LA6110	Project Phase-I	0	0	4	2
LA6310	Aptitude Building-II	0	0	2	1
	Total				**22**

After VI semester student will undergo minimum 6 weeks Industrial Training which will be evaluated in the VII semester.

Department of Mechanical Engineering
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Batch: 2016-20

Year: 4th **Semester: VII**

Course Code	Course Title	L	T	P	Credit
LA7210	Computer Integrated Manufacturing	3	0	2	4
LA7220	Automobile Engineering	3	1	2	4.5
LA7030	Power Plant Engineering	3	0	0	3
LA7010	Total Quality Management	3	0	0	3
UG	Elective –I	3	0/1	0	3/3.5
LA7110	Project Phase II	0	0	4	2
LA7510	Industrial Training and Presentation*	0	0	8	4
	Total				**23.5/24**

* During Summer Vacation after VI semester students are compulsorily required to attend Industrial Training of 6-8 weeks which will be evaluated in VII Semester under Industrial Training Presentation (LA7510).

List of UG Electives		
Course Code	**Course Title**	Credits
LA7020	INDUSTRIAL AUTOMATION AND ROBOTICS	3.5
LA7610	MAINTENANCE ENGINEERING & MANAGEMENT	3.0
LA7620	FUEL, COMBUSTION AND ENVIRONMENT	3.0
LA7630	SOLAR ENERGY	3.0

* During Summer Vacation after VI semester students are compulsorily required to attend Industrial Training of 68 weeks which will be evaluated in VII Semester under Industrial Training Presentation (LA7510).

Year: 4th **Semester: VIII**

Course Code	Course Title	L	T	P	Credit
	Open Elective	3	0	0	3
	UG Elective –II	3	1	0	3.5
	UG Elective –III	3	1	0	3.5
	UG Elective –IV	3	1	0	3.5
LA8110	Project Phase–III	0	0	8	4
	Total				**17.5**

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20
List of UG Electives

	Course Code	Course Title
Elective-II	LA8610	Non-Conventional Energy Resources
	LA8690	Automatic Control
	LA8600	Mechatronics
Elective-III	LA8620	Computational Methods for Heat Transfer and Fluid Flow
	LA8640	Machine Tool Design
	LA8670	Mechanical Vibrations
Elective-IV	LA8650	Advanced Engineering Materials
	LA8660	Product Design & Development
	LA8680	Finite Element Methods

List of Open Electives (To be conducted in VIII Semester)

Sl. No.	Branch	Subject Code	Name of Elective subjects
1	Physics	OA8710 OA8720	1. Nano Scale Science and Technology 2. Photonics Technology
2	EE	EA8710 EA8720	1. Non-Conventional Energy Resources 2. Instrumentation and Process control
3	ME	LA8710 LA8720	1. Entrepreneurship development 2. Quality Management
4	Civil	CA8710 CA8720	1. Environment and Ecology 2. GIS
5	CSE	DA8740 DA8710	1. Management Information System (MIS) 2. Business Intelligence
6	IT	IA8730 IA8720	1. Internet of Things 2. IT In Business
7	ECE	FA8710	1. Consumer Electronics
8	Humanities	HA8710 HA8720	1. Industrial Psychology 2. Human Values and Ethics
9	MBA	GA8710 GA8730 GA8740	1. Organizational Behavior 2. Digital Marketing 3. Financial Modeling with Spread sheet

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Engineering Mathematics-I**			Course Code: **JA1010**
Credit: **3.5**	L **3**	T **1**	P **0**
Year: **1st**			Semester: **I**

UNIT I: Differential Calculus-I [**9**]

Functions of single variable: Limit continuity and differentiability; Indeterminate forms; Mean value theorems; Role's Theorem; Taylor's theorem with remainders; Curve tracing.

UNIT II: Differential Calculus-II [**9**]

Successive differentiation; Leibnitz theorem; Partial differentiation; Euler's theorem; Expansion of functions of several variables; Extrema of functions of several variables; Lagrange's method of multipliers.

UNIT III: Integral Calculus [**9**]

Improper integral-Beta and Gamma functions; Double and Triple integrals; change of order of integration; change of variables; Dirichlet's integral and its applications; Application of multiple integral.

UNIT IV: Vector Calculus [**12**]

Vector Differentiation: Scalar and vector fields; gradient of scalar point function; directional derivatives; divergence and curl of vector point function; solenoidal and irrotational vectors.

Vector Integration: line, surface and volume integrals; Green's theorem; Stokes' theorem and Gauss divergence theorem (without proof).

Text Books:

- R. K. Jain & S. R. K. Iyenger, **Advanced Engineering Mathematics**, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.

Reference Books:

- E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, John &Wiley Sons, U.K., 2006.
- B. S. Grewal, **Higher Engineering Mathematics**, 42th Edition, Khanna publication, New Delhi, India, 2012.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Engineering Chemistry**	Course Code: **BA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **I**

UNIT – I

Water Chemistry

Introduction, Analysis of Water – Alkalinity, Chlorides and Dissolved Oxygen, Hardness of Water - Temporary and Permanent hardness, Estimation of hardness by EDTA Method, Disadvantages of Hard Water, Numerical problems.

Water for Industrial purpose – Boiler Feed Water, Boiler Troubles (Priming and Foaming, Boiler Corrosion, Scales and Sludges, Caustic Embrittlement), Water Treatment: Internal Treatment (Colloidal, Phosphate, Calgon, Carbonate Conditioning), External Treatment (Lime-Soda Process, Zeolite Process, Ion- Exchange Process), Numerical Problems.

UNIT – II

Physical Chemistry

Electrochemistry: Reference electrodes, Ion selective electrodes, Chemically modified electrodes as sensors, Electrochemical energy systems, Lithium batteries, Fuel cells.

Thermochemistry: Hess's Law, Heat of a reaction, Effect of temperature on heat of reaction at constant pressure (Kirchoff's eq.), Heat of dilution, Heat of hydration, Heat of neutralization and Heat of combustion.

Surface chemistry: Surface and interfacial tension, Capillary pressure.Adsorption phenonmenon, Adsorption of gaseson solids, Frendlich and Langmuir adsorption isotherms,Role of adsorbents in catalysis, ion-exchange and pollution abatement.

UNIT – III

Science of Corrosion and Protective Coatings

Introduction, Types of Corrosion, Theories of Corrosion and Mechanism, Factors Influencing Corrosion.Control of Corrosion.

Types of Protective Coatings: Metallic Coatings, Anodic Coatings, Galvanization, Cathodic Coatings, Tinning, Metal Cladding, Electroplating (Chromium Plating, Metal Spraying, Cementation-Sheradizing, Colourizing, Chromizing).

UNIT – IV

Introduction to Polymers and Nano-materials

Polymerization, Classification of polymers, Addition and Condensation Polymerizations. Plastics - Thermosetting and Thermoplastics. Preparation, Properties and Uses of Polyethylene, PVC, Teflon, Bakelite, Nylon, Polyester, Polyurethane, Ziegler-Natta catalyst, conducting polymers.Rubber-Processing of Natural Rubber, Vulcanization and Compounding. Elastomers: Buna-S, Buna- N, Thiokol.

Introduction to Nano-materials: Fullerenes, Nano-tubes, Nano-wires, Nano-cones, Nano-dots, Nano-sphere, Haeckelites. Their electronic and mechanical properties, Production methods for CNTs. Applications of nano materials in i) Medicine ii) Catalysis iii) Environmental Technologies iv) Electronics& related fields. v) Mechanics.

UNIT – V

Fuels & Lubricants

Fuels: Classification, crude oil: composition and fractionation, Octane & Cetane Number and their significance; calorific value of fuel, Determination of calorific value of fuels, bomb calorimeter, Solid fuels - Proximate and ultimate analysis, Numericals problems.

Lubricants: Functions of lubricants, Mechanism of Lubrication (thick film or hydrodynamic lubrication, thin film or boundary lubrication, extreme pressure lubrication), Classification and properties of lubricants-Viscosity, Flash and fire point, Cloud and pour point, Aniline point, Neutralization number and mechanical strength. Numerical problems on acid value and saponification value.

Text Books:

1. Chemistry in Engineering & Technology (Vol I & II) (Latest ed.) By J.C. Kuriacose& J. Rajaraman, Tata McGraw-Hill Co, New Delhi.
2. Engineering Chemistry by O.G. Palanna, Tata McGraw-Hill Co, New Delhi.

Reference Books:

1. Atkins' Physical Chemistry by Peter W. Atkins and Julio de Paula, Oxford University Press.
2. Principles of Physical Chemistry (Latest ed.) By Puri, Sharma & Pathania.
3. Organic chemistry, Morrison and Boyd, Pearson Prentice Hall, 2011
4. Environmental chemistry, S.E. Manahan, 9th edition, CRC Press.
5. Textbook of polymer science by F.W. Billmeyer, Wiley India.

Engineering Chemistry Lab

List of Experiments

1. Estimation of hardness of water by EDTA method
2. Estimation of total alkalinity in the given water sample.
3. Estimation of dissolved oxygen in the given water sample.
4. Estimation of available chlorine in the given sample of bleaching powder.
5. pH-metric titration.
6. Determination of viscosity of lubricants by Redwood viscometer / Ostwald's viscometer.
7. Determination Surface Tension of lubricants.
8. Determination of Flash point of a given oil by Pensky_Marten's flash point approach.
9. To Determine Saponification-value of the given Lubricating Oil.
10. To Determine Acid-Value of the given Lubricating Oil.
11. To determine the moisture, volatile and ash contents in a given coal sample by proximate analysis.
12. To study the adsorption of acetic acid on activated charcoal.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Introduction to Electrical Engineering**			Course Code: **EA1210**
Credit: **4.5**	L **3**	T **1**	P **2**
Year: **1st**			Semester: **I**

UNIT – 1
D.C. NETWORK THEORY
Review of basic circuit theory concepts, Mesh and Nodal analysis, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Star–delta transformation, Magnetic Circuits.

UNIT – 2
A.C. CIRCUITS & MEASURING INSTRUMENTS
*Single Phase A.C.:*Phasor representation of voltage and current, A.C. circuit behavior of resistance, inductance, capacitance & their combination in series and parallel, Power triangle, Power factor, Concept of series & parallel resonance.
*Three Phase A.C.:*Star – delta connections, Relation between line and phase quantities, three phase power and its measurement, What is 3 phase 4 wire and 3 phase 5 wire system?
Measuring Instruments: Construction and principle of voltage and current measuring instruments.

UNIT – 3
TRANSFORMERS
Principle of operation, Types of construction, Phasor diagram, Equivalent circuit, Efficiency and voltage regulation of single phase transformer, O.C. and S.C. tests.

UNIT – 4
D.C. & SYNCHRONOUS MACHINES
D.C. Machines: Construction and working principle of d.c. generator and d.c. motor, Types of d.c. machines, E.M.F. equation, Torque equation, Magnetization and load characteristics, Losses and efficiency, Need of starter in d.c. motors.
Synchronous Machines: Construction and Principle of operation of Alternator and Synchronous Motor.

UNIT – 5
INDUCTION MOTORS
Three Phase Induction Motors: Principle of operation of 3-Ø induction motor, Types of 3-Ø induction motor, Need of starters in 3-Ø induction motors, Slip – torque characteristics,
Single Phase Induction Motor: Principle of operation of single phase induction motor, Methods of starting of single phase induction motor.

Reference Books:
1. V. Del Toro. " Principles of electrical Engineering, "Prentice hall International.
2. W.H. Hayt& J.E. Kemmerly," Engineering circuit Analysis, "McGraw Hill.
3. I. J. Nagrath, "Basic Electrical Engineering," Tata Mc. Graw Hill.
4. A. E. Fitgerald, D.E., Higginbotham and A Grabel, "Basic Electrical Engineering" McGraw Hill
5. H. Cotton, "Advanced Electrical Technology" Wheeler Publishing.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Basic Electrical Engineering Lab

(Any Ten)

1. Verification of Network Theorems.
2. Study of diode characteristics. Study of phenomenon of resonance in RLC series circuit.
3. Measurement of power in a three phase circuit by two wattmeter method.
4. Measurement of efficiency of a single phase transformer by load test.
5. Determination of parameters and losses in a single phase transformer by OC and SC test.
6. Study of characteristic of DC Motor.
7. Study of characteristic of AC Motor.
8. DC generator characteristics.
9. 10. Speed control of dc shunt motor.
10. Study running and reversing of a three phase induction motor.
11. Study of a single phase energy meter.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Introduction to Electronics & Communication**	Course Code: **FA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **I**

UNIT 1: Fundamental of Semiconductors ***10 L***

Energy bands in semiconductors, intrinsic and extrinsic semiconductors, Fermi Level in Intrinsic and Extrinsic semiconductor, Carrier transport in semiconductors: diffusion current, drift current, mobility, Hall Effect and resistivity. Generation and recombination of carriers.

UNIT 2: Application of Low Power and High Power Diodes ***10 L***

Diode circuits: Construction, Junction diode characteristics, Half and full wave rectifiers - Expression for efficiency and ripple factor - Bridge rectifier – π Filter circuits, Clipper, Clamper and multipliers using diodes, Zener Diode Characteristics - Regulated power supply using Zener diode.

UNIT 3: Transistor fundamentals ***8 L***

Transistor circuits: Characteristics of a transistor in CB, CE and CC modes - Relatively merits - Biasing of Transistors - Load Line and operating point concept (both AC and DC). Construction and working of JFET and MOSFET.

UNIT 4: Digital fundamentals and Introduction to Signals ***8 L***

Basic logic gates: AND, OR, and NOT – implementation of all gates using Universal gates, Number Systems conversions, Boolean algebra, K-map (upto 4 variables). Source of Information, Types of Signals.

UNIT 5: Basics of Communications & Instrumentation ***9 L***

*C*ommunication Systems, Communication Channels, Need of modulation, Types of modulations (Wave shapes and final expression only), Study of Piezoelectric, PMMC, LVDT and Strain Gauge transducers and their classifications and display device (7 segment) only.

Reference Books:

Unit 1. Electronics Devices and Circuits, Millman and Halkias, Tata McGraw Hill, 4th ed.
Unit 2 & 3. Electronic Devices and Circuit Theory, Robert L. Boylestad, Prentice Hall Higher Edu., 2000.
Unit 4. Digital Design, Morris Mano, PHI
Unit 4. Modern Digital & Analog Communications, B. P. Lathi, OUP
Unit 5. Electronic Communication Systems, John Kennedy , Tata McGraw Hill, 4th ed.
Unit 5. Electronic Instrumentation - H. S. Kalsi

ELECTRONICS ENGINEERING LAB.

1. To identify and Study of the various component and Devices of electronics with their specification (CRO, Function Generator, Multimeter, Power Supply, resistor, capacitor, inductor, ICs, LED, potentiometer etc.)
2. To study the V-I characteristics of PN diode and Zener diode.
3. To find the efficiency of Rectifiers and ripple factor of capacitive and non-capacitive half wave and full wave rectifier.
4. To Study and Verify clipper and clamper with biased circuits.
5. To find the characteristics of CB and CE amplifiers.
6. Determine the characteristics of FET.
7. To find out the power energy of various periodic and non periodic signals.
8. To verify the logic gates using diodes.
9. Study and observations of AM & FM Waveforms.
10. Study of various transducers (Strain Gauge).

***** *Plus 2-3 value added experiments can be performed.*

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Professional Communication – I**	Course Code: **HA1210**
Credit: **3.5**	L **3** T **1** P **0**
Year: **1st**	Semester: **I**

UNIT 1: **COMMUNICATION** **(6 Hrs)**

1. Communication: Definition and Process of Communication.
2. Types of Communication: Formal and Informal Communication, Verbal and Non-Verbal Communication.
3. Barriers to Communication: Intrapersonal and Interpersonal Barriers. Semantic Barriers, Physical Barriers, Psychological Barriers, and Organizational Barriers.

UNIT 2: **LISTENING SKILLS & SPEAKING SKILLS** **(8 Hrs)**

1. Importance and Objective of Listening Skills, Process of Listening, Listening and Hearing, Types of Listening, and Methods for Improving Listening Skills
2. Listening Comprehension: Identifying General and Specific Information.
3. Listening for Note taking and drawing Inferences.
4. Importance of Speaking Skills, Types of Speaking, Methods for Improving Speaking Skills
5. Introduction to Phonetic Transcription: Familiarization with British and American Usage.

UNIT 3: **READING SKILLS** **(4 Hrs)**

1. Importance of Reading Skills, Types of Reading Skills, Methods of Improving Reading Skills.
2. Vocabulary Building: Antonyms, Synonyms, Homophones, Homonyms, and One-Word Substitution, Etymology and roots.

UNIT 4: **WRITING SKILLS** **(10 Hrs)**

1. Importance of Writing Skills, Types of Writing Skills, and Methods for Improving Writing Skills.
2. Sentence and Paragraph Construction. Writing Expository, Argumentative and Deductive Order etc Paragraphs.
3. Précis Writing
4. Basic Letter Writing: Format and Style of Formal Letters.

UNIT 5: **ONE ACT PLAY** **(6 Hrs)**

Practice of LRSW through the study of the one act play, ***THE REFUND*** by **Fritz Karinthy**.

TEXT BOOK

1. Gupta, Ruby. Basic Technical Communication, Cambridge University Press, New Delhi.2012.

REFERENCE BOOKS

1. Rizvi, Ashraf. Effective Technical Communication, McGraw Hill, New Delhi. 2005
2. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011
3. Tyagi, Kavita& Padma Misra. Basic Technical Communication, PHI, New Delhi. 2011
4. Lewis, Norman. Word Power Made Easy, W.R Goyal Pub. & Distributors.1995
5. Ford A, Ruther. Basic Communication Skills; Pearson Education, New Delhi.2013
6. Aslam, Mohammad. Introduction of English Phonetics and Phonology Cambridge.2003
7. Kameswari, Y. Successful Career Soft Skills and Business English, BS Publications, Hyderabad.2010
8. English Pronouncing Dictionary, Cambridge.2012
9. The Oxford Guide to Writing and Speaking. OUP, Delhi.2011

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20
Professional Communication – I Lab

Lab 1	Neutralization of Mother Tongue Influence through manner of articulation
Lab 2	Common Errors in English and Indianisms.
Lab 3	Introduction to Speech Sounds – Practicing Vowel and Consonant sounds
Lab 4	Syllable, word stress, Sentence stress
Lab 5	Pause group, Intonation & Rhythm
Lab 6	Functional English
Lab 7 & 8	Everyday Conversation : Greetings, Apologies, Requests, At a Restaurant, Shopping, Groceries, Hiring an Apartment, Travel Courses, etc.
Lab 9	Developing Listening skills through cultural movies
Lab 10 &11	Movie - To provide exposure to the target language
Lab 12	Final evaluation based on Extempore

References: (Software and Videos)

1. Wordsworth English Language laboratory software
2. Wordsworth Prep 1-2-3
3. Connected Speech Level 1-2-3
4. Learn To speak English CD 1-2-3-

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Computer Fundamentals and 'C' Programming**			Course Code: **DA1210**
Credit: **4**	L **3**	T **0**	P **2**
Year: **1st**			Semester: **I**

UNIT 1 **(8 L)**

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system: Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

UNIT 2 **(8 L)**

Standard I/O in C, Fundamental data types- Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external**,** Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Fundamentals of C programming: Structure of C program**,** writing and executing the first C program, components of C language. Standard I/O

UNIT 3 **(8 L)**

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch**,** program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break, continue and goto statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

UNIT 4 **(8 L)**

Arrays: Array notation and representation, manipulating array elements using one and two dimensional arrays, linear searching, sorting (bubble sort), strings, matrix manipulation (transpose, addition, multiplication).

Structures: Purpose and uses of structures, declaring structures, array of structures, union, enumerated data types

UNIT 5 **(8 L)**

Pointers: Pointers: pointer variables, pointer operator, pointer expression, array of pointers, multiple indirection, pointers to functions, dynamic memory allocation functions.

File handling**,** standard C preprocessors**,** defining and calling macros, conditional compilation.

Text Books:

1. YashwantKanetkar, "Let us C", BPB Publications, 2nd Edition, 2001.
2. Herbert Schildt, "C:The complete reference", OsbourneMcgraw Hill, 4th Edition, 2002.
3. Computer Fundamentals and Programming in C. ReemaThareja, Oxford Publication
4. P.K. Sinha "Computer Fundamentals" B.P.B Publication.

Reference Books:

1. Raja Raman, "Computer Programming in C", Prentice Hall of India, 1995.
2. Kernighan & Ritchie, "C Programming Language", The (Ansi C Version), PHI, 2nd Edition.
3. Byron Gottfreid "Schaum's Outline of Programming with C".

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20
List of Programs in 'C' Lab

Lab 1	(a) WAP to perform simple arithmetic operations using different data types. (b) WAP to show swap of two no's without using third variable.
Lab 2	(a) WAP to find the roots of a quadratic equation. (b) WAP to check the number is odd or even and find the sum of all odd and all even separately.
Lab 3	(a) WAP to find out whether the given number is prime or not. Find sum of all prime upto N. (b) WAP to reverse a given number and check the palindrome status.
Lab 4	WAP to print corresponding days of a week using switch case.
Lab 5	WAP to find and generate the Armstrong number.
Lab 6	WAP to print pattern triangle like Floyd's, Pascal, pyramid triangle.
Lab 7	(a) WAP to interchange two values using call by value and call by reference. (b) WAP to print factorial of a number using recursion & without using recursion.
Lab 8	WAP to print Fibonacci series. (**a**) Without using function (**b)** using function (**c)** using recursion
Lab 9	(a) WAP to print an array and find greatest/smallest element of an array. (b) WAP to perform linear searching in an array.
Lab 10	(a) WAP to insert/ delete element from an array. (b) WAP to sort the array's element using Bubble sort.
Lab 11	WAP to perform the following string functions. **a.** Strlen **b**. strcmp **c.**strcpy **d**. strcat **e**. strlwr **f**.strupr
Lab 12	Declare a suitable structure of a college and print the name and DOB of the student have scored more than sixty percent marks in end semester exam.
Lab 13	Declare a suitable structure for an organization and print all the names of employees having salary more than Rs.1000.

Course Title: **Workshop Practice**			Course Code: **LA1110**
Credit: **1**	L **0**	T **0**	P **2**
Year: **1st**			Semester: **I**

List of Experiments

1. Carpentry: To make a T-Lap joint with soft wood.
2. Arc Welding: To make a Lap joint with mild steel flat by arc welding process.
3. Gas Welding: To make a Lap joint of M.S. sheet with gas welding process.
4. Fitting: To make a plug and socket joint with M.S. flat.
5. Machine Shop: To turn a M.S. rod on lathe to prepare a turning specimen.
6. Sheet Metal: To make a square tray with G.I. sheet.
7. Study of Foundry and Forging tools and equipments

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Engineering Mathematics – II**	Course Code: **JA2010**
Credit: **3.5**	L **3** T **1** P **0**
Year: **1st**	Semester: **II**

UNIT I: **(10L)**

Linear Algebra

Matrices; Inverse of matrix; Echelon form; Rank of matrix; Consistency and solution of a system of linear equations; Linear dependence and independence of vectors; Matrix transformations; Eigen values and eigenvectors; Cayley– Hamilton theorem; Reduction to diagonal form; Vector spaces; Sub spaces; Basis; Dimension; Linear Transformation**.**

UNIT II: **(8L)**

Differential Equations

Linear differential equations first order and first degree; Linear differential Equations of higher orders with constant coefficients; Complementary functions and Particular integrals; Euler-Cauchy linear differential equations; Simultaneous linear differential equations; Method of variation of parameters.

UNIT III: **(6L)**

Infinite Series

Introduction; Sequences; Series; Convergence; Series of positive terms; Comparison test; Integral test; D'Alembert's Ratio test; Cauchy's root test; Alternating series; Leibnitz rule.

UNIT IV: **(8L)**

Fourier Series

Periodic functions; Fourier series of Periodic functions; Euler's formulae; Functions having arbitrary period; Change of intervals; Even and Odd functions; Half range sine and cosine series.

UNIT V: **(8L)**

Laplace Transform

Laplace Transform; Existence theorem; Properties of Laplace Transform ; Laplace Transform of derivatives and integrals; Laplace Transform of Periodic functions; Unit Step function and Error Function; Dirac- Delta function; Unit impulse function; Convolution theorem; Applications of Laplace Transform to solve linear and simultaneous differential equations.

Text Books:

1. R. K. Jain & S. R. K. Iyenger, **Advanced Engineering Mathematics**, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.
2. E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, John Wiley & Sons, U.K., 2006.

Reference Books:

1. W. E. Boyce and R. Di Prima, **Elementary Differential Equations**, (8th Edition), John Wiley & Sons, U.K., (2005).
2. B. S. Grewal, **Higher Engineering Mathematics**, 42nd Edition, Khanna Publication, New Delhi, India, 2012.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Engineering Physics**	Course Code: **OA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **II**

UNIT I:

Relativistic Mechanics: Inertial and Non-inertial Frames; Postulates of Special Theory of Relativity; Galilean and Lorentz Transformation; Length Contraction and Time Dilation; Addition of Velocities; Variation of Mass with Velocity and Mass Energy Equivalence.

UNIT II:

Interference: Introduction; Coherent Sources; Analytical treatment of interference; Young's double slit experiment and its analysis; Conditions of Interference; Fresnel's Biprism; fringes with white light; Determination of wavelength of monochromatic light by using Fresnel's Biprism method; Displacement of Fringes; Interference in plane parallel thin film (reflected and transmitted light) and wedge shaped film(reflected light only); Newton's Rings; Determination of wavelength of monochromatic light and determination of refractive index of a liquid by using Newton's ring method.

UNIT III:

Diffraction: Introduction; Difference between Interference and diffraction; resultant of superposition of n simple harmonic coherent vibrations; Fraunhofer diffraction due to single slit: resultant intensity; conditions of maxima; minima; angular and linear width of central maximum; Double slit diffraction: resultant intensity; missing order; N-slit diffraction : resultant intensity; conditions of maxima and minima; missing orders; angular width of principal maxima; Diffraction grating: formation of spectra and missing order spectra in spectrum; dispersive power of grating; Resolving power; Rayleigh Criterion of resolution; Resolving power of plane transmission diffraction grating.

UNIT IV:

Polarization: Polarised and unpolarised light and its pictorial representation; plane of polarisation and plane of vibration; Phenomenon of Double Refraction; positive and negative double refracting crystals; properties of ordinary and extra-ordinary Rays; Nicol Prism and its application as a polariser and analyser; Mathematical analysis of superposition of two linearly polarised light vectors; retardation plates – half wave plate and quarter wave plate; Production and detection of Plane; Circularly and Elliptically Polarized Light.

Laser: Spontaneous emission; stimulated emission and stimulated absorption; Einstein's A and B Coefficients and relation between them; Principle of Laser Action; Construction and Working of He-Ne; Semiconductor Laser.

UNIT V:

Wave Mechanics : Wave Particle Duality; de Broglie Concept of Matter Waves; Davisson and Germer experiment; Concept of wave packet; group and phase velocity; Heisenberg Uncertainty Principle and its applications viz. non existence of electron in nucleus; radius and energy of Bohr's first orbit; Schrödinger time independent and time dependent wave equation; Physical interpretation of wave function; Application of Schrodinger wave equation: Particle in a one dimensional box (eigen function and eigen values).

Introduction to Fibre Optics: Fundamental ideas about optical fiber; Types of fibers; Acceptance angle and cone; Numerical Aperture.

Text Books:

1. AjoyGhatak**; Optics;** Tata Mc-Graw Hill Education;2009.
2. Subramanyam; BrijLal;**A Text Book of Optics**; S. Chand, 2004.
3. K. Thyagarajan, AjoyGhatak; **Lasers: Fundamentals and Applications**; Second;Springer, 2010.
4. AjoyGhatak& K. Thyagarajan ;**Introduction to Fiber optics;**Cambridge University Press,1998.
5. Halliday, Resnick& Walker; **Principles of Physics**; Nineth, Wiley, India;2013

Reference Books:

1. Arthur Beiser ;**Concepts of Modern Physics**; Tata Mc-Graw Hill Education;2003.
2. Robert Resnick;**Introduction to Special theory of Relativity** ; First; John Wiley& Sons; 1968.
3. Jenkins and White ;**Fundamentals of Optics**; Fourth; McGraw-Hill;2001
4. David. J. Griffith; **An Introduction to Quantum Mechanics**;Second; Pearson prentice Hall; 2004.
5. Young and Freedman;**Sears and Zemansky's University Physics**,Tenth; Addison-Wesley, 2000.

List of Experiments

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help ofFresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locatethe position of cardinal points.
4. To determine the specific rotation of cane sugar solution using bi quartz polarimeter.
5. To determine the wavelength of spectral lines using plane transmissiongrating.
6. To determine the specific resistance of the material of given wire usingCarey Foster's bridge.
7. To determine the variation of magnetic field along the axis of a currentcarrying coil and then to estimate the radius of the coil.
8. To verify Stefan's Law by electrical method.
9. To calibrate the given ammeter using potentiometer.
10. To calibrate the give voltmeter using potentiometer.
11. To determine energy band gap of a given semiconductor material by p-n junction method.
12. To determine the viscosity of water by Poisseuille's method.

Note: Additional experiments may be added based on contents of syllabus.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Essentials of Mechanical Engineering**			Course Code: **LA1210**
Credit: 4**.5**	L **3**	T **1**	P **2**
Year: **1st**			Semester: **II**

UNIT – I **9L**

Introduction to Engineering: Difference between Science and Technology, history of wheel, introduction to prime movers, transmission system, belt, pulleys, gear system and nomenclature, braking system, Mechanism, lever mechanism, Working principle of power generation system, hydel power plant, thermal power plant and its main components.

Coplanar Force system: Resolution of force in two mutually perpendicular direction Free Body Diagram, Moment, Varignon's theorem, static equilibrium, Lami'sTheorem, type of joints/Support, Type of load: point load, uniformly constant and varying loads, beam and its type.

UNIT – 2 **7L**

Engineering material and their properties: Details of hook's law, Proportional limit, Yield point, Yield Stress, Engineering strain, Engineering stress, True stress and Strain, Plasticity, Elasticity, Allowable Strength, Hardness, Ductility, toughness, Fatigue, creep, strain energy, Impact Strength, Young modulus of Elasticity, Bulk Modulus, Poission Ration and its relation in between.

Stress and strain: Normal stress and strain, principle of Superposition, Deformation in stepped and composite bar.

UNIT – 3 **7L**

Thermodynamics: Macroscopic & microscopic study point of view, System, Surrounding and Universe, Phase, Property, State, Path, Process, Cyclic and non-cyclic processes, Quasi static process, Reversible and irreversible processes , Thermodynamic equilibrium, Concept of continuum, Energy and its forms, Enthalpy, Zeroth law, Different temperature scales and theory of temperature and Pressure measurement.

UNIT – 4 **8L**

Laws of Thermodynamics: Thermodynamic definition of work, Thermodynamic processes, Calculation of work in various processes and sign convention, Non-flow work and flow work, Joules' experiment, First law of thermodynamics, Internal energy and enthalpy, First law of thermodynamics applied to open systems, Steady flow energy equation and its applications, First law analysis for closed system (non flow processes), Limitations of first law of thermodynamics, PMM-I.

Statement of Second Law of Thermodynamics: Kelvin Planck's statement and Clausius statement and their equivalence.

UNIT – 5 **9L**

Power generation: Air standard cycle**,** IC Engine**,** Carnot cycle, Otto cycle, Diesel cycle, Important components of I.C.Engine, two stroke and four stoke engine, S.I. and C.I. engines, efficiency of Otto and diesel cycle

Basics of Heat Transfer: Concepts of the mechanisms of heat flows: conduction, convection and Radiation heat transfer application in engineering.

Reference Books:

1. Basu,A.R; A Text book of Engineering Mechanics(Applied Mechanics);2003 Edition; Dhanpat Rai & co.(p) Ltd, Delhi.

2. Chandramouli, P.N; Engineering Mechanics; Second Printing; PHI Learning Private Limited, Delhi; 2013.
3. Rajput, R. K; Material Science; S. K. Kataria & Sons, New Delhi.
4. Dubey, N. H; Engineering Mechanics, Statics and Dynamics; First reprint; McGraw Hill Education (India) Private Limited, New Delhi, 2013.
5. Ratan, S.S; Theory of machines; Second Edition; Tata McGraw Hill Publishing Company Limited, New Delhi.
6. Nag.P.K.; Engineering Thermodynamics; 3rd Edition; Tata McGraw Hill Publishing Company Limited, New Delhi.
7. Nag.P.K.; Heat and Mass Transfer; Tata McGraw Hill Publishing Company Limited, New Delhi.
8. Kumar.D.S; Basic of Mechanical Engineering; S. K. Kataria & Sons, New Delhi.

Essentials of Mechanical Engineering Lab

List of Experiments

1. Tensile test
2. Impact test
3. Hardness test
4. Pulley experiment
5. Experiment on conduction heat transfer
6. Demonstration of Impulse and reaction turbine
7. Study of 4s and 2S engine petrol Engine
8. Study of 4s and 2S engine Diesel Engine
9. Study of refrigerator and air conditioning

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Professional Communication – II**			Course Code: **HA2210**
Credit: **3.5**	L **3**	T **0**	P **1**
Year: **1st**			Semester: **II**

UNIT 1: **PROFESSIONAL COMMUNICATION** **(6 Hrs)**

1. Importance and Features of Business Communication, Flow and Channels of Communication in an Organization.
2. Introduction to Technical Communication, Types and History of Technical Communication.
3. Difference between General and Technical Communication, and Importance of Technical Communication.
4. Characteristic of Technical Communication, and Elements of Style.
5. Process of Preparing a Technical Document.
6. Elements and Features of Scientific Articles.
7. Compunication, E- mail, E- tools and Encyclopedia.

UNIT 2: **BUSINESS CORRESPONDENCE** **(8 Hrs)**

1. Business Correspondence – Principles, Features, Types, Format and Layout of Business Letter.
2. Inter Office Correspondence – Letters of Enquiry, Quotation, Order, Sales, and Complaint.
3. Intra Office Correspondence: Notice, Agenda, Minutes, and Memorandum.
4. Job Application Letter.

UNIT 3: **TECHNICAL PROPOSAL and TECHNICAL REPORT** **(8 Hrs)**

1. Technical Proposal - Introduction, Purpose, Features, Types, Format, Importance, and Writing Technical Proposals and Plagiarism.
2. Technical Report - Features, Types, Style, Format, Relevance, and Writing Technical Reports.

UNIT 4: CORPORATE COMMUNICATION SKILLS **(8 Hrs)**

1. Dimensions and importance of EQ
2. Interpersonal communication skills - Life Position, and Transactional Analysis
3. Johari Window: Role of Feedback and Disclosure in Communication; Accepting Criticism
4. Cross Cultural Communication
5. Attitude
6. Perception
7. Personality Attributes and Communication: Self Esteem, Self-Monitoring, Impression Management, and Locus of Control.
8. Conflict and Negotiation

UNIT 5: PROJECT **(6 Hrs)**

REPORT WRITING/ PROPOSAL WRITING

The students will write a Report **OR** a Proposal consisting of 10-15 pages.

REPORT WRITING

1. **For B.Tech. students**-
    a. Technical Report describing new machinery, a report on the sudden break down in production unit, and market survey report for formulating new market strategy.
2. **For B.Pharma. students**
    a. Technical Report based on the site inspection of a drug manufacturing unit, Survey Report on Health Awareness and Self-Medication.
3. **For B.Arch. students**

a. Technical Reports based on a Site Inspection for Geographical and Geological aspects of a particular location, A Report on the Architectural Survey of a Monument. Architectural

PROPOSAL WRITING

1. **For B.Tech. students**
   a. Technical Proposal to organize a Technical Training Program, To develop new range of a product and to start a new venture.
2. **For B.Pharma. students**
   a. Technical proposal to establish a new laboratory, To create new drug-composition and to visit to a Super Specialty Hospital.
3. **For B.Arch. students**
   a. Technical Proposal for an Archeological Site visit , To Construct New Buildings.

Report Writing and Proposal Writing carries 30 marks equivalent to three class tests.

TEXT BOOK

1. Gupta, Ruby. Advanced Technical Communication, Cambridge University Press, New Delhi. 2011.

SUGGESTED REFERENCE BOOKS

1. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011.
2. Tyagi, Kavita& Padma Misra. Advance Technical Communication, PHI, New Delhi.2011
3. Technical Communication, Cengage Learning, New Delhi.2010
4. Technical Communication, OUP, New Delhi. 2013
5. Wallace, Masters Personality Development, Cengage Learning, New Delhi.2006
6. Barrass, Robert: Students Must Write, Foundation books, Cambridge, New Delhi.2006
7. Rao, Bhaskar: Successful Career Soft Skills and Business English, BS Publications, Hyderabad.2012
8. Chakrawarthi: Soft Skills for Professionals, Wiley India.2011

Professional Communication – II Lab

Lab 1	Vocabulary Building
Lab 2	Telephone Etiquette: Making an appointment , answering Calls
Lab 3	Public Speaking
Lab 4	Group Discussion: Do's and Don'ts of GD
Lab 5 & 6	Interview Skills: Preparation
Lab 7	PP Presentation Skills: Techniques of making effective presentation
Lab 8	Meeting : Conducting meetings effectively
Lab 9	Developing Negotiating skills
Lab 10 &11	Reading Comprehension
Lab 12	Evaluation

References: (Software and Videos)

1. Wordsworth English Language laboratory software
2. Wordsworth Prep 1-2-3
3. Communicate
4. Train 2 Success
5. Additional PPTs

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Computer Programming in C++**			Course Code: **DA2210**
Credit: **4**	L **3**	T **0**	P **2**
Year: **1st**			Semester: **II**

Unit -1 **8L**

Introduction to Object Oriented Programming, including methodologies, programming techniques, Object Oriented languages.
Overview of C++ basic structures, including the main () function, C++ data types, different type of operators expressions and statements, standard Input/output, Simple flow of control, Defining user defined Functions.

Unit -2 **8L**

General overview of objects and classes, Object and classes in C++, including class definition, Defining members inside or outside, accessing of members, constructors, types of constructors, destructors and Pointer to class object.

Unit-3 **8L**

Polymorphism: function overloading, methods of overloading, constructor overloading, Operator overloading.
General overview of inheritance: Introduction, Categories of inheritance, public/protected/private inheritance, constructors and destructors in derived classes, and Virtual Base class.

Unit-4 **8L**

Function overriding and virtual functions, Abstract class and abstract base class, Friend functions, Templates in C++, function templates, class templates, templates and inheritances, templates and static members.

Unit-5 **8L**

File handing in C++: opening of file, closing of file, text files, binary files, Reading and writing into a file. Exception Handling in C++, including usage, try, throw and catch.

Text Books:

1. Kip R. Irvine, C++ and Object-Oriented Programming, Prentice Hall, 1997
2. R. Lafore, "Object Oriented Programming using C++", BPB Publications, 2004
3. E Balagurusamy "Object Oriented Programming with C++" T.M.H 2nd edition

Reference Books:

1. Schildt Herbert, "C++ Programming", 2nd Edition, Wiley DreamTech.
2. YashwantKanethkar, "Object Oriented Programming using C++",BPB, 2004

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

List of Programs in 'C++' Lab

Lab 1	(a) WAP to print first 10 prime numbers. (b) WAP to demonstrate nested loops. (c) WAP to print reverse of a given number. (d) WAP to read two numbers from keyboard and display the larger one.
Lab 2	(a) Create a class called Employee that includes three pieces of information as instance Variables – a first name (type String), a last name (type String) and a monthly salary (Double) (b) Create a constructor in above class to initialize the three instance variables. Provide a get method for each instance variable. (c) WAP to demonstrate destructors.
Lab 3	(a) Program to implement different types of inheritances like Multiple, Multilevel and hybrid. (b) Write a program in C++ demonstrating the public, protected and private parameters. (c) Write a program in C++ to demonstrate destructor in inheritance. (d) WAP to demonstrate encapsulation property of OOPs.
Lab 4	(a) Write a program that uses a class where the member functions are defined inside a class. (b) WAP that uses a class where member functions are defined outside a class. (c) WAP that uses a class where member functions are defined inside a class. (d) WAP to demonstrate the use of Static Data members.
Lab 5	(a) WAP to demonstrate the use of Dynamic Constructor. (b) WAP to demonstrate the use of function Template. (c) Illustrate and implement the C++ program to initiate the base constructor from derived class constructor.
Lab 6	(a) Write a C++ program to find the largest and smallest element of an array.
	(b) Create a class Matrix. Implement all possible matrix operations for Matrix type objects by overloading them.
Lab 7	(a) Create 2 classes OM and DB which store the value of distance. DM store distances in meters and cm and DB in feet and inches. Write a program that can read values for the class objects and add 1 object OM with another object of DB.
	(b) Define a class to represent bank account. Include the following members: **Data members** 1. Name of depositor. 2. Account number. 3. Type of account. 4. Balance amount in the account. **Member functions** 1. To assign initial values. 2. To deposit an amount. 3. To withdraw an amount after checking the balance. 4. To display name and balance. Write a main program to test the program.
Lab 8	(a) WAP to demonstrate static class data. (b) WAP to demonstrate the use of Public, Private and protected classes.
Lab 9	(a) WAP to illustrate the concept of call by reference. (b) WAP to illustrate the concept of unary operator overloading. (c) WAP to illustrate the concept of binary operator overloading.
Lab 10	(a) WAP to demonstrate the use of function overloading. (b) WAP using multiple inheritance for collecting employee details.
Lab 11	(a) WAP using function template to find maximum of two Data. (b) WAP to calculate factorial of given number using copy constructor.
Lab 12	(a) WAP to sort five float and integer numbers using template function (use bubble sort). (b) Demonstrate the use of different types of polymorphism.
Lab 13	(a) Write a function to read a matrix of size M × N from keyboard. (b) WAP to implement aggregation concept.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Environmental Science**	Course Code: **BA1010**
Credit: **2**	L **2** T **0** P **0**
Year: **1st**	Semester: **II**

Unit – 1 **(6L)**

Natural Resources: Renewable and non-renewable resources

Definition, scope, importance and need for public awareness, natural resources and associated problems.

- Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
- Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
- Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture and green revolution, water logging, salinity.
- Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources.
- Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Unit – 2 **(5L)**

Ecosystems

Concept, Structure and function of an ecosystem, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the Forest and aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit – 3 **(5L)**

Biodiversity and its conservation

Introduction – Definition: genetic, species and ecosystem diversity. Bio geographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-sports of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit – 4 **(6L)**

Environmental Pollution

Definition, Cause, effects and control measures of:-

a. Air pollution b. Water pollution c. Soil pollution
d. Marine pollution e. Noise pollution f. Thermal pollution
g. Nuclear hazards

• Solid waste Management and biomedical waste: Causes, effects and control
• Role of an individual in prevention of pollution.
• Pollution effects-global warming, acid rain, ozone depletion, smog and case studies.
• Disaster management: floods, earthquake, cyclone and landslides.

Unit – 5 **(6L)**

Social Issues and the Environment

- From Unsustainable to Sustainable development
- Water conservation, rain water harvesting, watershed management
- Environmental Impact Assessment and Resettlement and rehabilitation problems.
- Climate change
- Wetland conservation.
- Role of remote sensing and GIS in environmental monitoring and analysis
- Environment Protection Act. 1986
- Air (Prevention and Control of Pollution) Act. 1981
- Water (Prevention and control of Pollution) Act 1974
- Wildlife Protection Act 1972
- Forest Conservation Act 1980.

Field work:

- Visit to a local area to document environmental assets river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

REFERENCE BOOKS:

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad –380 013, India, Email:mapin@icenet.net (R)
2. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
3. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
4. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
5. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
6. Gleick, H.P. 1993. Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
7. Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
8. Mckinney, M.L. & School, R.M. 1996. Environmental Science Systems & Solutions, Web enhanced edition. 639p.
9. AnubhaKaushik&Kaushik, C.P. 2009.Perspectives in Environmental Studies, New Age International Publishers.
10. Manahan. S.E., Environmental chemistry, 9th edition.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Engineering Graphics**	Course Code: **LA1220**
Credit: 1	L **1** T **0** P **0**
Year: **1st**	Semester: **II**

UNIT – 1
Introduction: Sheet Layout, Types of Sheet, Size of Sheets, Title blocks, Type of lines, Lettering, Dimensioning, Scale (Full, Reduced, Large) Geometrical Constructions,

UNIT – 2
Projection: Methods of Projection, Planes of Projection, Projection of points, Projection of straight lines, Projection of auxiliary planes, Projection of planes.

UNIT – 3
Projection of solids, Sections of solids.

UNIT – 4
Development of surfaces

UNIT – 5
Isometric Projections

Reference Books:
1) Bhatt N. D. & Panchal V. M, "Engineering Drawing", Charotar Publisher, 2007.
2) Dhanjay A Jolhe, "Engineering Drawing" Tata McGraw Hill, 2008.
3) Gill P.S "Engineering Graphics" S. K. Kataria & Sons, 2009
4) John K.C, "Engineering Graphics" , 2nd edition, PHI Learning Pvt. Ltd., 2010

List of Experiments

1. Introduction to AutoCAD Commands, Explaining need of AUTO CAD over Manual drafting, Simple Drawings.
2. Sheet on Lettering and Geometric construction.
3. Orthographic Projections, Basic problem based on Projection of points.
4. Sheet on Projection of Lines.
5. Sheet on Projection of Planes.
6. Sheet on Projection of Auxiliary Planes.
7. Sheet on Projection of Solids.
8. Development of Surfaces.
9. Sheet on Isometric Projections from orthogonal views.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Material Science**	Course Code: **LA3210**
Credit:4.5	L T P **3 1 2**
Year: 2nd	**Semester: III**

UNIT-I **7L**

Introduction: Historical perspective, importance of materials. Brief review of modern & atomic concepts in Physics and Chemistry, Atomic models, Periodic table, Chemical bonding.

Crystallography and Imperfections: Concept of unit cell space lattice, Bravais lattices, common crystal structures, Atomic packing factor and density. Miller indices. X-ray crystallography techniques. Imperfections, Defects & Dislocations in solids.

UNIT-II **10L**

Mechanical properties and Testing: Stress strain diagram, Ductile & brittle material, Stress vs strength, Toughness, Hardness, Fracture, Fatigue and Creep. Testings such as Strength testing, Hardness testing, Impact testing, Fatigue testing Creep testing, Non-destructive testing (NDT).

Micro structural Exam: Microscope principle and methods. Preparation of samples and Microstructure exam and grain size determination. Comparative study of microstructure of various metals & alloys such as Mild steel, CI, Brass.

Phase Diagram and Equilibrium Diagram: Unary and Binary diagrams, Phase rules. Types of equilibrium diagrams: Solid solution type, eutectic type and combination type. Iron-carbon equilibrium diagram.

UNIT-III **8L**

Ferrous materials: Brief introduction of iron and steel making furnaces. Various types of carbon steels, alloy steels and cast irons, its properties and uses.

Heat Treatment: Various types of heat treatment such as Annealing, Normalizing, Quenching, Tempering and Case hardening. Time Temperature Transformation (TTT) diagrams.

Non-Ferrous metals and alloys: Non-ferrous metals such as Cu, Al, Zn, Cr, Ni etc. and its applications. Various type Brass, Bronze, bearing materials, its properties and uses. Aluminum alloys such as Duralumin. Other advanced materials/alloys.

UNIT-IV **7L**

Magnetic properties: Concept of magnetism – Dia, para, ferro Hysteresis. Soft and hard magnetic materials, Magnetic storages.

Electric properties: Energy band concept of conductor, insulator and semi-conductor. Intrinsic & extrinsic semi-conductors. P-n junction and transistors. Basic devices and its application. Diffusion in Solid. Super conductivity and its applications. Messier effect. Type I & Type II superconductors.

UNIT-V **9L**

Ceramics: Structure, types, properties and applications of ceramics. Mechanical/Electrical behavior and processing of Ceramics.

Plastics: Various types of polymers/plastics and its applications. Mechanical behavior and processing of plastics. Future of plastics.

Other materials: Brief description of other material such as optical and thermal materials concrete, Composite Materials and its uses. Brief introduction to Smart materials & Nano-materials and their potential applications

Performance of materials in service: Brief theoretical consideration of Fracture, Fatigue, and Corrosion and its control.

Reference Books:

1. W.D. Callister, Jr, - Material Science & Engineering Addition-Wesley Publication, 7th edition, 2007.
2. K.M.Gupta, Materials Science, Umesh Publication, 7th edition, 2005.
3. Van Vlack - Elements of Material Science & Engineering, John Wiley & Sons, 6th edition, 2010.
4. V. Raghvan - Material Science, Prentice Hall, 5th edition, 2005.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20
MATERIAL SCIENCE LAB (PME-351)

List of Experiments

1. Making a plastic mould for small metallic specimen.
2. Specimen preparation for micro structural examination-cutting, grinding, polishing, etching.
3. Grain size determination of a given specimen.
4. Comparative study of microstructures of different given specimens (mild steel, gray cast iron, brass, copper etc.)
5. Heat treatment experiments such as annealing, normalizing, quenching, case hardening and comparison of hardness before and after.
6. Material identification of, say, 50 common items kept in a box.
7. Faradays law of electrolysis experiment.
8. Study of corrosion and its effects.
9. Study of microstructure of welded component and HAZ. Macro and Micro Examination.
10. Suitable experiment on Magnetic/ Electrical/ Electronic materials.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Engineering Thermodynamics**	Course Code: **LA3010**
Credit:3.5	L **3** T **1** P **0**
Year: 2nd	**Semester: III**

UNIT-I **8L**

Review of First law of Thermodynamics

Second Law of thermodynamics: Limitations of first law of thermodynamics, essence of 2nd law of thermodynamics, Kelvin Planck's statement of second law of thermodynamics, Clausius statement of second law of thermodynamics, Equivalence of two statements of second law of thermodynamics, Thermal reservoir, Heat engine, Heat pump, refrigerator, Reversible and irreversible process, Carnot cycle and Carnot engine, Carnot theorem and it's corollaries, thermodynamic temperature scale, PMM-II.

UNIT-II **8L**

Entropy: Definition**,** Clausius theorem, Clausius inequality, Entropy a property of system, change in entropy for process, Tds relations, entropy principle, application of entropy principle for mixing of two fluids, Third law of thermodynamics.

UNIT-III **8L**

Properties of pure substance: Pure substance, Property of steam, Triple point, Critical point, Sub-cooled liquid, Saturation states, Superheated states, Phase transformation process of water, Graphical representation of thermodynamic processes on P-T & P-V diagrams, T-S and H-S diagrams, Use of property diagram, Steam-Tables and Mollier charts, Dryness fraction and it's measurement.

UNIT-IV **8L**

Available energy, Exergy and Irreversibility: Source of energy, Available energy and Unavailable energy, dead state and useful work, available energy referred to a cycle, quality of energy, maximum work in a reversible process, availability of energy entering a system, availability of closed system, reversible work by an open system exchanging heat only with surroundings, useful work, dead state, availability, second law efficiency.

UNIT-V **8L**

Thermodynamic relations: properties of ideal and real gases, Helmholtz and Gibb's function, Mathematical conditions for exact differentials. Maxwell Relations, Clapeyron Equation, Joule-Thompson coefficient and Inversion curve, Coefficient of volume expansion, Adiabatic & Isothermal compressibility.

Reference Books:

1. P.K. Nag, Engineering Thermodynamics", Tata McGraw Hill Education,2005.
2. Moran, M.J., and Shapiro, H.M., "Fundamentals of Engineering Thermodynamics", 4th Ed.,John Wiley & Sons 2000.
3. Wark, K. Jr., and Donald, E.R., "Thermodynamics", 6th Ed. McGraw-Hill 1999.
4. Arora, C.P., "Thermodynamics", 2nd Ed., Tata-McGraw-Hill 2002.
5. Gordon, R., and Mayhew, Y., "Engineering Thermodynamics and Heat Transfer", 4th Ed.,Addison-Wesley 2001.
6. Cengel, Y.A. and Boles, M.A., "Thermodynamics: An Engineering Approach", 3rd Ed., TataMcGraw-Hill 2002.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Strength of Materials**	Course Code: **LA3030**
Credit:3.5	L **3** T **1** P **0**
Year: **2nd**	Semester: **III**

UNIT-I **7L**

Simple stress and strain: Introduction and definitions; Hooke's law; true and engineering stress-strain curves; axial stress; thermal stress and strain.

Compound stress and strains: Introduction; state of plane stress; stress on an inclined plane; Maximum normal stress and strain; Mohr's stress circle.

Introduction to centre of gravity and moment of inertia of commonly used cross sections

UNIT-II **10L**

Stresses in Beams: Shear force and bending moment diagrams; bending stress in beams; shear stress in beams and shear stress distribution diagrams.

Torsion of circular shaft: Torsion equation; shaft in series and parallel; combined bending and torsion in shafts.

UNIT-III **8L**

Strain energy: Concept and application; Impact load & stresses; Castigliano's theorem.

Deflections of Beams: Introduction; differential equation of the deflected beam; Macaulay's method; Moment area method.

UNIT-IV **8L**

Thin cylinders and shells: Hoop and axial stresses and strain, volumetric strain.

Thick cylinders: Radial, axial and circumferential stresses in thick cylinders subjected to internal and external pressures; Compound cylinder.

UNIT-V **8L**

Column and strut: Combined bending and direct stress; middle third and middle quarter rules; Euler's theory of buckling of column for different end conditions; limitations of Euler's formula; Rankine's formula.

Introduction to three dimensional stress and strain: Equilibrium equation, Normal and shear-stresses and strains; Generalized Hook's Law; Theories of failure.

Text Books:

6. Rajput, R.K.," **Strength of Materials"**; 5th Edition, S Chand and Company Ltd.; New Delhi.

Reference Books:

1. Dr. Sadhu Singh, **"Strength of Materials";** 10th Edition, Khanna Publishers New Delhi.
2. Ramamrutham, S. and Narayanan, R., **"Strength of Materials";** Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 17th Edition.
3. Gere, James M. and Goodno, Barry J., **"Mechanics of Materials";** 8th Edition,THOMSON Books/Cole., Singapore.
4. Nash, William, **"Schaum's Outline of Strength of Materials"**; 6th Edition, McGraw-Hill Education (India) Private Limited, New Delhi-110016
5. Pytel, Andrew and Kiusalaas, Jaan, "**Mechanics of Materials";**2nd Edition (2012), THOMSON Books/Cole., Singapore.
6. Jindal, U.C., **"Strength of Materials";** 2012 Edition, Pearson Education.
7. Dr. R.K. Bansal, **"A Textbook of Strength of Materials";** 5th Edition, 2012, Laxmi Publications(P) Ltd., New Delhi-110002

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Manufacturing Process – I**	Course Code: **LA3030**
Credit:3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III**

UNIT – I **9L**

Introduction: Importance of manufacturing, Economic and technological considerations in manufacturing. Classification of manufacturing processes.

Metal Forming Processes: Elastic & plastic deformation, yield criteria. Hot working vs cold working.

Forging equipments and methods: hand, drop and die forging.

Rolling: Rolling mills and Rolling mills & rolled-sections, Friction angle and rolling force, no slip condition.

Drawing and Extrusion processes: Wire / strip drawing, tube drawing and extrusion processes and their applications, lubrication in metal forming operation, defects in formed parts.

UNIT – II **9L**

Sheet Metal working: Presses and their classification, Die & punch assembly and press work methods and processes, Cutting/Punching mechanism, blanking vs piercing, Compound vs Progressive die, Flat-face vs Inclined-face punch and Load (capacity) needed.

Analysis of forming process like cup/deep drawing. Bending & spring-back.

Blank development force and press tonnage calculation in shearing, bending and deep drawing operations.

UNIT – III **8L**

Powder Metallurgy: Powder metallurgy manufacturing process. The need, process, advantage and applications.

Jigs & Fixtures: Locating & Clamping devices & principles, Jigs and Fixtures and its applications.

UNIT – IV **7L**

Manufacturing of Plastic components: Review of plastics, and its past, present & future uses, Injection moulding, Extrusion of plastic section. Welding of plastics. Future of plastic & its applications. Resins & Adhesives.

UNIT – V **9L**

Casting (Foundry): Basic principle & survey of casting processes, Types of patterns and allowances. Types and properties of moulding sand, Elements of mould and design considerations, Gating, Riser, Runnes, Core, Solidification of casting, Sand casting, defects & remedies and inspection.

Die Casting, Centrifugal casting, Investment casting, CO_2 casting and Stir casting etc.

Reference Books:

1. Ghosh and Malik, "Manufacturing Science" East West Press Pvt Ltd, 2nd edition, 2010.
2. Groover, M.P., "Fundamentals of Modern Manufacturing", John Wiley & Sons 2002.
3. DeGarmo, E. P., Black, J.T., and Kohser, R.A., "Materials and Processes in Manufacturing", Prentice-Hall of India1997.
4. Kalpakjian, S., and Schmid, S.R., "Manufacturing Engineering and Technology", Pearson Education 2000.
5. Lindberg, R.A., "Processes and Materials of Manufacture", Prentice- Hall of India 1990.
6. Rao,P.N., "Manufacturing Technology", (Vol. 2), Tata McGraw-Hill 1998.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Kinematics of Machines**	Course Code: **LA3040**
Credit:3.5	L **3** T **1** P **0**
Year: **2nd**	Semester: **III**

UNIT – I **8L**

Introduction: Link or element, kinematic pairs, degrees of freedom, Grubler's criterion (without derivation), Kinematic chain, Mechanism, structure, Mobility of Mechanism, Inversion, Machine.

Kinematic chains and inversions: Inversions of Four bar chain; Single slider crank chain and Double slider crank chain. **Mechanisms:** Whitworthquick return motion mechanisms, Crank and slotted lever Mechanism, Exact straight line motion and approximate straight line motion mechanisms.

UNIT – II **10L**

Velocity and acceleration analysis of mechanisms (graphical method): Velocity and acceleration analysis of Four Bar mechanism, slider crank mechanism and Simple Mechanisms by vector polygons and by instantaneous centre method. Relative velocity and acceleration of points on a link, relative velocity and accelerations of coincident Points on separate links Coriolis component of acceleration, Angular velocity and angular acceleration of links.

Analytical method: Analysis of single slider crank chain using analytical equation of motion

UNIT – III **8L**

Spur gears: Gear terminology, law of gearing, Characteristics of involute action, Path of contact, Arc of contact, Contact ratio, Interference in involute gears, Methods of avoiding interference, Back lash, Comparison of involute and cycloidal teeth.

UNIT – IV **7L**

Gear trains: Simple gear trains, Compound gear trains for large speed reduction, Epicyclic gear trains, Tabular Method of finding velocity ratio of Epicyclic gear trains.

UNIT – V **7L**

Cams: Types of cams, Types of followers, Displacement, Velocity and Acceleration vs time curves for cam profiles. Disc cam with reciprocating follower having knife-edge, roller and flat-faced follower, Disc cam with oscillating roller follower, Follower motions including SHM, Uniform velocity, uniform acceleration & retardation and Cycloid motion.

Reference Books:

1.Theory of Machines, Rattan S.S, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1993.
2. The Theory of Machines, Thomas Bevan, CBS Publisher, 1984.
3. Theory of Machines & Mechanisms, Shigley J.E. and Uickers, J. J., McGraw-Hill, 1995.
4. Theory of Machines, Khurmi.R.S. and Gupta.J.K, S.Chand & Company Ltd..New Delhi, 2005.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Electrical Machines**	Course Code: **EA32L0**
Credit:4.5	L **3** T **1** P **2**
Year: **2nd**	Semester: **III**

UNIT – I **7L**

Single phase Transformer: Construction, phasor diagram, Voltage Regulation, OC & SC Test, Polarity test, Sumpner's test, all day efficiency

Three phase Transformer: Construction: core type, shell type, three phase bank of single phase transformer, scott connection.

Autotransformer: Volt-Ampere Relationship, efficiency, advantages and disadvantages, applications.

UNIT – II **9L**

DC Machine: Construction, EMF and torque equation, Armature Reaction, Commutation, Methods to improve Commutation, performance characteristics of motors and generators, starting of motors, speed control methods, losses, efficiency, applications.

UNIT – III **8L**

Three phase Induction Motor: Constructional features, Rotating magnetic field, Principle of operation Phasor diagram, equivalent circuit, torque and power equations, Torque- slip characteristics, Speed Control, starting of squirrel cage and slip ring induction motor.

UNIT – IV **8L**

Synchronous Machine: Constructional features, Armature winding, EMF Equation, Winding coefficients, equivalent circuit and phasor diagram, Armature reaction, Working principle of synchronous generator, O. C. & S. C. tests, Voltage Regulation using Synchronous Impedance Method ,Working principle of synchronous motor, Starting torque and mechanical power developed, Effect of varying field current at different loads, V-Curves, application.

UNIT – V **5L**

Special Purpose Machines:

Two phase servomotor: Construction, working principle and application.

Stepper motor: construction, working principle and application.

Text Books:

1. Dr.P.S.Bhimbra, "Electrical Machinery",Khanna Publishers India
2. D.P.Kothari & I.J.Nagrath, "Electric Machines", Tata McGraw Hill

Reference Books:

1. Sen, "Principles of Electrical Machines & Power Electronics", Wiley India
2. O.C. Taylor, "The performance & design of A.C. Commutator Motors", A.H.Wheeler & Co(P) Ltd.

List of Experiments

Note: Minimum eight experiments are to be performed from the following list. The department may add 3 to 4 more experiments in the following list.

1) Polarity and voltage ratio test of a 1- phase transformer.
2) O.C and S.C test of 1-phase transformer
3) Sumner's test on two identical 1-phase transformers.
4) Internal and external characteristics of dc shunt motor
5) Load test on dc shunt motor.
6) Speed control of dc shunt motor.
7) Load test on 3-phase induction motor.
8) O.C and S.C test of synchronous machine.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **MACHINE DRAWING**			Course Code: **LA3110**
Credit:1	L **0**	T **0**	P **2**
Year: **2nd**			Semester: **III**

Machine Drawing Conventions: Need for drawing conventions, introduction to IS conventions; **(any three)**

a) Conventional representation of materials and common machine components.
b) Representation of geometrical and dimensional tolerance.
c) Representation of surface roughness and direction of lay of machining.
d) Representation of welded joints.
e) Sectional views and sectioning.

Computer aided Drafting: Generation of points, lines, curves, polygons, dimensioning, utility commands etc.Use of modeling software.

Drawing of Machine Elements and simple parts: Views of **any three** sets of the following machine elements and parts:

a) Popular forms of Screw threads, bolts, nuts, stud bolts.
b) Keys, cotter joints and knuckle joint.
c) Shaft coupling, spigot and socket pipe joint.
d) Journal, pivot and collar and foot step bearings.
e) Rivet joints for plates

Assembly Drawings: Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions; **(any one)**

a) Engine parts – stuffing boxes, cross heads, connecting rod,piston assembly.
b) Other machine parts - Screws jacks, Machine Vices, Plummer block, Tailstock.
c) Valves : Steam stop valve, spring loaded safety valve, feed check valve and air cock.

Reference Books:

1. Bhatt. N. D. and Panchal.V.M. **"Machine Drawing"**; Charotar Publishing House Pvt. Ltd. Anand (Gujrat), 388001, 49th Edition, 2014.
2. Narayana. K.L, Kannaiah P. & Reddy K. Venkata, **"Machine Drawing"**; New Age International (P) Ltd. Publishers, New Delhi-110002, 4th Edition, 2012.
3. Gill P.S, **"A Textbook of Machine Drawing"**; S. K. Kataria & Sons Publishers, New Delhi-110002, 18th Edition, 2013.
4. Dhawan R.K, **"A Textbook of Machine Drawing";** S. Chand Publishing, New Delhi-110055.
5. Sidheswar. N, Kannaiah. P, & Sastry V.V.S.,**"Machine Drawing";** McGraw-Hill Education (India) Private Limited, New Delhi-110016, 2001
6. Pohit. Goutam & Ghosh. Goutam, **"Machine Drawing with AutoCAD"**; Pearson Education, Delhi.
7. John. K.C, **"A Textbook of Machine Drawing";** PHI Learning, Delhi.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Engineering Mathematics – III**	Course Code: **JA3010**
Credit:3.5	L **3** T **1** P **0**
Year: **2nd**	Semester: **IV**

UNIT – I **8L**

Complex variable- I

Elementary functions; limit, continuity & differentiability; Analytic Functions; Cauchy – Riemann equations; Harmonic functions; Line integral in the complex plane; Cauchy's Integral theorem; Cauchy's Integral formula for derivatives of analytic function.

UNIT – II **6L**

Complex Variables -II

Power series; Taylor's series; Laurent's series; Poles; Zeros; Singularities; Residue Theorem; Evaluation of real integrals of the type $\int_0^{2\pi} f(\cos\theta, \sin\theta)d\theta$ and $\int_{-\infty}^{\infty} f(x)dx$.

UNIT – III **8L**

Special Functions

Series solution of ODE of 2nd order with variable coefficient with special emphasis to Legendre and Bessel differential equation by Frobenious method; Legendre polynomial of first kind; Bessel function of first kind and their properties.

UNIT – IV **8L**

Fourier Transform & Z-transform

Fourier integral; Fourier transform; Fourier sine and cosine transforms; Linearity, Scaling, frequency shifting and time shifting properties; Convolution theorem and its application.

Z – Transform; Properties of Z-transforms; Convolution of two sequences; Inverse Z-transform; Solution of difference equations.

UNIT – V **8L**

Partial differential equations and its Applications

Introduction to partial differential equations; Linear partial differential equations with constant coefficients of second order and their classification; Method of Separation of Variables for solving Partial Differential Equations; One-Dimensional Wave Equation; One Dimensional Heat Equation.

Text Books:

1. Brown & Churchill: **Complex Variables & Applications**, 9th edition, McGraw-Hill, 2013.
2. R. K. Jain & S. R. K. Iyenger, **Advanced Engineering Mathematics**, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.

Reference Books:

1. B. S. Grewal, **Higher Engineering Mathematics**, 42th Edition, Khanna publication, New Delhi, India, 2012.
2. E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, John Wiley & Sons, U.K., 2006.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Manufacturing Process-II**	Course Code: **LA4210**
Credit:4	L **3** T **0** P **2**
Year: 2nd	**Semester: IV**

UNIT – I **8L**

Metal Cutting and Machine Tools: Mechanics of metal cutting. Geometry of tool and nomenclature as per ASA system. Comparison between orthogonal and oblique cutting. Mechanics of chip formation and types of chips. Shear angle relationship. Merchant's force circle diagram. Calculations of cutting forces and power required. Cutting fluids/lubricants. Tool materials. Tool wear and tool life. Machinability. Brief introduction to machine tool vibration and surface finish. Economics of metal cutting.

UNIT – II **8L**

Machine Tools: Lathe: Principle, types, operations, Turret/capstan, semi-automatic, automatic lathes. Shaper, slotter, planer: operations & drives.

Milling: Milling cutters, up & down milling. Dividing head & indexing,

Drilling and boring: Drilling, boring, reaming tools, Geometry of twist drills.

UNIT – III **10L**

Grinding and Super finishing:

Grinding: Grinding wheels, abrasive, cutting action. Grinding wheel- specifications, attritions wear, fracture wear, dressing and truing. Maximum chip thickness and Guest criteria. Surface and Cylindrical grinding, Center less grinding.

Super finishing: Honing, lapping, and polishing.

Surface finish: description and measurements.

Limits, Fits & Tolerance: Introduction to Limits, Fits, Tolerances and IS standards, Interchangeability and standardization.

UNIT – IV **8L**

Metal Joining (Welding): Survey of welding and allied processes, Gas welding and cutting process & equipments. Arc welding: Power sources and consumables. TIG & MIG processes and their parameters, Resistance welding-spot, seam projection etc. Other welding processes such as atomic hydrogen, submerged arc, electro slag, friction welding, soldering and brazing.

Thermodynamic and Metallurgical aspects in welding Shrinkage/residual stress in welds. Distortions & Defects in welds and their remedies, Weld decay in Heat affected Zone.

UNIT – V **8L**

Introduction to non-conventional Manufacturing Process: Benefits, application and working principle of EDM, ECM, LBM, EBM, USM. AJM, WJM.

Non-conventional welding application such as LBW, USW, EBW, Plasma arc welding, Explosive welding and Explosive Forming.

Reference books:

1. PandeyP.C. &Singh, C.K., "Production Engineering", Standard Publisher Ltd, 1980.
2. Ghosh, A. and Malik, A.K., "Manufacturing Science", East West Press Ltd, 2010.
3. Sharma, P.C., "Production Technology", S.Chand Publication, 2013.
4. Rao, P.N., "Manufacturing Technology Vol. III", Tata McGraw Hills, 2013.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Manufacturing Process Lab

List of Experiments

1. Design of pattern for a desired casting (containing hole).
2. Pattern making.
3. Making a mould (with core) and casting.
4. Sand testing (at least one such as grain fineness number determination).
5. Injection moulding with plastics.
6. Forging hand forging processes.
7. Forging - power hammer study & operation.
8. Tube bending with the use of sand and on tube bending m/c.
9. Press work experiment such as blanking/piercing, washer, making etc.
10. Wire drawing/extrusion on soft material.
11. Rolling-experiment.
12. Bending & spring back.
13. Powder metallurgy experiment.
14. Jigs & Fixture experiment.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Dynamics of Machines**	Course Code: **LA4220**
Credit:4.5	L **3** T **1** P **2**
Year: **2nd**	Semester: **IV**

UNIT – I **9L**

Static force analysis: Static Force Analysis: Introduction: Static Equilibrium. Equilibrium of two and three Force Members, Member with two forces and torque, Free Body Diagram. Static Force Analysis of Four bar Mechanism and Slider-Crank Mechanism.

Dynamic force analysis: D'Alembert's Principle, Inertia Force, Inertia Torque, Dynamic Force Analysis of Single Slider Crank Mechanism. Dynamically Equivalent Systems, Turning Moment Diagrams and Flywheels, Fluctuation of Energy, Determination of size of flywheels.

UNIT – II **7L**

Friction and belt drives: Friction and frictional torque in Pivot and Collar Bearings, Brakes and Clutches, Belt Drives: Flat Belt Drives, Ratio of Belt Tensions, Centrifugal Tension.

UNIT – III **8L**

Balancing of rotating masses: Static and Dynamic Balancing, Balancing of Single Rotating Mass by Balancing Masses in Same plane and in Different planes. Balancing of Several Rotating Masses by Balancing Masses in Same plane and in Different planes.

Balancing of reciprocating masses: Inertia Effect of Crank and Connecting rod, Single Cylinder Engine, Balancing in Multi Cylinder-inline engine (Primary and Secondary forces).

UNIT – IV **8L**

Governors: Types of Governors; Force Analysis of Porter, Proell, Hartnell Governors, Controlling Force, Stability, Sensitiveness, Isochronism, Effort and Power.

UNIT – V **8L**

Vibration: Types of vibrations, Degrees of freedom, Single degree free & damped vibrations, Forced vibration of single degree system under harmonic excitation, Critical speeds of shaft **4**

Gyroscope: Law of gyroscope, Gyroscopic Couple, Effect of Gyroscopic Couple on Ship, Plane Disc, Aeroplane, Stability of Four Wheelers.

Reference books:

1. Theory of Machines, Rattan S.S, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1993.
2. The Theory of Machines, Thomas Bevan, CBS Publisher, 1984.
3. Theory of Machines & Mechanisms, Shigley J.E. and Uickers, J. J., McGraw-Hill, 1995.
4. Theory of Machines, Khurmi.R.S. and Gupta.J.K, S.Chand & Company Ltd..New Delhi, 2005.

Theory of Machines Lab

List of Experiments

1. To study the Different types of kinematic links, kinematic pairs and inversions of mechanisms.
2. To study different types of Gears and Gear trains.
3. To study different types of Cams and followers.
4. To perform the experiments of static and dynamic balancing on a shaft.
5. To perform the experiment on a governor and to plot the graph between "r" and "f".
6. To perform the experiment on the Gyroscope & prove the law of gyroscope.
7. To perform an experiment on cam dynamics apparatus.
8. To calculate the frequency of a free vibrating spring.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Fluid Mechanics**	Course Code: **LA4230**
Credit:4.5	L **3** T **1** P **2**
Year: **2nd**	Semester: **IV**

UNIT – I **8L**

Fluid Properties and Hydrostatics: Introduction to Fluid Mechanics, Definition of Fluid, Solid and Fluid Continuum, Definitions, Units and Dimensions of Mass density, Specific weight, Specific Volume, Relative density, Viscosity, Capillarity and Surface Tension, Newton's law of Viscosity, Equation for capillarity, Definition of Pressure, Hydrostatic pressure equation, Absolute and Gauge pressures, Measurement of Pressure; Simple and Differential Manometer, Buoyancy, Force exerted by a liquid on an inclined flat surface, Meta-centre and Meta-centric height**.**

UNIT – II **9L**

Kinematics of Fluid Flow: Introduction, Classification of flow, Three dimensional continuity equation in Cartesian coordinate, Stream function, Velocity potential, Stream line, Equipotential line (2D only).

Dynamics of Fluid Flow: Derivation of Euler's equation & Bernoulli's equation and its applications.

UNIT – III **9L**

Flow Measurements: Equation for discharge over triangular notch, Rectangular notch, Trapezoidal notch, Equations for discharge through horizontal and inclined venturimeter, Measurement of velocity using pitot tube, Classification of orifices.

Viscous flow: Basic Boundary layer theory: displacement, momentum and energy thickness, flow through circular pipe, fluid between two parallel plates, energy and momentum correction factor.

UNIT – IV **8L**

Flow through Pipes: Introduction, Reynolds's number and its significance, Major and minor losses in pipe flow, Equation for head loss due to friction, Equation for head loss due to sudden expansion, Pipes in series, pipes in parallel and equivalent pipes, Water Hammer in pipes, Equations for pressure rise due to gradual and sudden closure of valves.

UNIT – V **7L**

Dimensional Analysis and Model Studies: Introduction to Dimensional analysis, Units and dimensions, Dimensional Homogeneity, Raleigh's and Buckingham's methods of analysis, Model studies, similitude, dimensional parameters, Types of models.

Reference Books:

1. White, F.M., "Fluid Mechanics", McGraw Hill Pvt. Ltd., 7th edition, 2011.
2. Munson, "Fundamentals of Fluid Mechanics", Willey India Pvt Ltd,New Delhi, 6th edition, 2010.
3. Duglas, J. "Fluid Mechanics", Pearson Ltd, 14th edition, New Delhi, 2013.
4. Bansal R. K., Fluid Mechanics and Hydraulic Machine, Lakshmi Publications, New Delhi.
5. Bansal R. K., "A Text Book of Fluid Mechanics and Hydraulic Machine", Lakshmi Publications, N.Delhi, 2010.
6. Modi P.N and Seth S. M., "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi.
7. Rajput,R.K., "Text Book of Fluid Mechanics", S.Chand Publication, 4th edition,New Delhi, 2013.

Fluid Mechanics Lab

List of Experiments

1. Verification of Bernaulli's Theorem.
2. To calibrate an orifice meter and venturimeter, and determination of the co-efficient of discharge
3. Determination of coefficient of discharge for triangular, rectangular and trapezoidal notch.
4. Determination of Metacentric height for a floating ship
5. To study the transition from laminar to turbulent flown in a circular pipe.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Energy Conversion**	Course Code: **LA4010**
Credit:3.5	L **3** T **1** P **0**
Year: **2nd**	Semester: **IV**

UNIT – I **9L**

Vapor Power cycles: Carnot cycle, Effect of pressure & temperature on Rankine cycle, Reheat cycle, Regenerative cycle, Cogeneration.

Boilers: Classification, comparison between fire and water tube boilers, Essentials of a good boiler, Constructional and operational details of Locomotive& Lancashire Boilers, High pressure boilers- Benson, Lamont, Loeffler and Velox boilers, boiler mountings and accessories, air pre-heater, feed water heater, super heater, Boiler performance, Draught & its calculations, natural and forced draught, Chimney height, Maximum draft and chimney efficiency, Equivalent evaporation , Boiler trial and boiler heat balance sheet.

UNIT – II **7L**

Steam and Gas Nozzles: Flow through nozzle, Variation of velocity, Area and specific volume, Choked flow, Throat area, Nozzle efficiency, off design operation of nozzle, Effect of friction on nozzle, super saturated flow.

UNIT – III **8L**

Steam Turbines : Classification of steam turbine, Impulse and reaction turbines, Staging, Stage and overall efficiency, Reheat factor,state point locus, Bleeding, Velocity diagram of simple & compound multistage impulse & reaction turbines & related calculations work done efficiencies of reaction, Impulse reaction Turbines, Losses in steam turbines, Governing of turbines.

Condenser: Classification of condenser, Air leakage, Condenser performance parameters.

UNIT – IV **8L**

Compressors: Single stage reciprocating air compressor, volumetric efficiency, multi stage compression, rotary compressors, blowers and fans, Centrifugal compressor, Elementary theory, Vector Diagram& efficiencies, Surging and chocking.

UNIT – V **8L**

Gas Turbines: Gas turbine classification, Brayton cycle, Gas turbine cycles with inter cooling, reheat and regeneration and their combinations, Stage efficiency, Polytropic efficiency, Deviation of actual cycles from ideal cycles.

Reference books:

1. Rathore, M., "Thermal Engineering", McGraw Hill Education, 2013.
2. Cengel, Y. and Boles, M. "Thermodynamics",Tata McGraw Hill, 6th edition, 2008.
3. Nag, P.K., "Basic and Applied Thermodynamics", Tata McGraw Hill Company, 2nd edition, 2010.
4. Yadav, R., "Steam and Gas Turbine, CPH, Allahabad.
5. Ballaney, P.L., "Thermal Engineering", Khanna Publishers, 20th edition, 1994.
6. Ganeshan, V. "Gas Turbine", Tata McGraw Hill Publishing Company Ltd, New Delhi, 2002.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Machine Design – I**			Course Code: **LA4020**
Credit: 3.5	L **3**	T **1**	P **0**
Year: **2nd**			Semester: **IV**

UNIT – I **6L**

Introduction: Definition, Methods, standards in design & selection of preferred size.

Selection of materials for static & fatigue loads, Materials for components subjected to creep, BIS system of designation of steels, steels.

UNIT – II **9L**

Design against static load: Modes of failure, Factor of safety, stress-strain relationship, principal stresses, theories of failure

Design against fluctuating load: stress concentration, stress concentration factors, Fluctuating/alternating stresses, fatigue failure, endurance limit, design for finite & infinite life, Soderberg & Goodman criteria, S-N curve.

UNIT – III **9L**

Design of Joints: Welded joint, screwed joints, eccentric loading of above joints, joint design for fatigue loading.

Shaft, keys & coupling: Design against static and fatigue loads, strength & rigidity design, Selection of square, flat keys and splines, rigid and flexible couplings.

UNIT – IV **8L**

Mechanical springs: Design of Helical and leaf springs, against static & fatigue loading.

UNIT – V **8L**

Design analysis of Power Screws: Form of threads, square threads, trapezoidal threads, stresses in screw, design of screw jack.

Reference books:

1. Mechanical Engineering Design – Joseph E. Shigley, McGraw Hill Publications, 8th Edition, 2008
2. Design of Machine Elements-V.B. Bhandari, Tata McGraw Hill Co., 3r Edition, 2010
3. M.F Spotts, T.E Shoup, L.E. Hornberger, S.R Jayram and C V Venkatesh, *Design of Machine Elements*, 8th Ed., Pearson Education, 2006
4. Machine Design-Sharma and Agrawal, S.K. Katara & Sons.
5. Faculty of Mechanical Engineering, PSGCollege of Technology, "Design Data Book ", DPV Printers, 1993.
6. Machine Design Data Book, V B Bhandari, 1st Edition, 2014, McGraw Hill Education (India) Pvt. Ltd.

Course Title:**Industrial Tour**	Course Code: **LA4410**
Credit: 1	L **0** T **0** P **2**
Year: **2nd**	Semester: **IV**

Duration : 1 week

Visit to the industry to make the students familiar with various industrial processes and systems.

Course Title: **Value Addition Training**	Course Code: **LA4Z11**
Credit: 1	L **0** T **0** P **2**
Year: **2nd**	Semester: **IV**

Training on commercial modeling software's.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Fluid Machinery**	Course Code: **LA5210**
Credit: 4.5	L **3** T **1** P **2**
Year: **3rd**	Semester: **V**

UNIT – I **8L**

Introduction: Classification of Fluid Machines, Application of momentum and momentum equation to flow through hydraulic machinery, Euler's fundamental equation.

Impact of jet: Introduction to hydrodynamic thrust of jet on a fixed and moving surface (flat & curve), effect of inclination of jet with the surface.

Hydraulic Turbines: Classification of turbines, Impulse turbines, constructional details, velocity triangles, power and efficiency calculations, governing of Pelton wheel.

UNIT – II **8L**

Reaction Turbines: Fransis and Kaplan turbines, constructional details, velocity triangles, power and efficiency calculations, degree of reaction, draft tube, cavitation in turbines, principles of similarity, unit and specific speed, performance characteristics, selection of water turbines.

UNIT – III **8L**

Centrifugal Pumps: Classifications of centrifugal pumps, vector diagram, work done by impellor, efficiencies of centrifugal pumps, specific speed, model testing, cavitation and separation, performance characteristics.

UNIT – IV **8L**

Positive Displacement Pumps: Reciprocating pump theory, slip and coefficient of discharges, indicator diagram, effect and acceleration, work saved by fitting air vessels, comparison of centrifugal and reciprocating pumps, positive rotary pumps, Gear and Vane pumps, performance characteristics.

UNIT – V **8L**

Other Machines: Hydraulic accumulator, Intensifier, Hydraulic press, Lift and Cranes, theory of hydraulic coupling and torque converters, performance characteristics.

Water Lifting Devices: Hydraulic ram, Jet pumps, Airlift pumps**,** water distribution systems.

References books:

1. White, F.M., "Fluid Mechanics", McGraw Hill Pvt. Ltd., 7th edition, 2011.
2. Munson, "Fundamentals of Fluid Mechanics", Willey India Pvt Ltd,New Delhi, 6th edition, 2010.
3. Duglas, J. "Fluid Mechanics", Pearson Ltd, 14th edition, New Delhi, 2013.
4. Bansal R. K., Fluid Mechanics and Hydraulic Machine, Lakshmi Publications, New Delhi.
5. Bansal R. K., "A Text Book of Fluid Mechanics and Hydraulic Machine", Lakshmi Publications, N.Delhi, 2010.
6. Modi P.N and Seth S. M., "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi.
7. Rajput, R.K., "Text Book of Fluid Mechanics", S.Chand Publication, 4th edition,New Delhi, 2013.

FLUID MACHINERY LAB
List of Experiments

1.To determine the coefficient of impact jet vane combination by comparing the actual force with the theoretical force for stationary vanes of different shapes.
2.To find out Pelton wheel turbine efficiency by comparing the fluid energy to mechanical energy.
3.To find out the performance of Francis turbine.
4.To study the performance of reciprocating pump
5.To study the performance of centrifugal pump.
6.Study through visit of any pumping station/plant.
7.Study through visit of any hydraulic power plant.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Heat and Mass Transfer**	Course Code: **LA5220**
Credit: 4.5	L **3** T **1** P **2**
Year: **3rd**	Semester: **V**

UNIT – I **6L**

Introduction to Heat Transfer: Concepts of heat flows: conduction, convection and radiation; effectof temperature on thermal conductivity of materials; introduction to combined heat transfer mechanism.

Conduction: One-dimensional general differential heat conduction equation in the rectangular, cylindrical and spherical coordinates, initial and boundary conditions.

Steady State one-dimensional Heat conduction : Composite Systems in rectangular, cylindrical and spherical coordinates with and without Energy generation; thermal resistance concept; Analogy between heat and electricity flow; thermal contact resistance; Overall Heat Transfer Coefficient, critical thickness of insulation.

UNIT – II **9L**

Fins: Types of fins, Fins of uniform cross-sectional area; errors of measurement of temperature in thermometer wells.

Transient Conduction: Lumped capacitance method, unsteady state heat conduction in one dimension only, Heisler charts.

UNIT – III **9L**

Forced Convection: Basic concepts; hydrodynamic boundary layer; thermal boundary layer, flow over a flat plate; flow across a single cylinder and a sphere; flow inside ducts; empirical heat transfer relations; relation between fluid friction and heat transfer; liquid metal heat transfer.

Natural Convection: Physical mechanism of natural convection; buoyant force; empirical heat transfer relations for natural convection over vertical plates and cylinders, horizontal plates and Cylinders, and sphere.

UNIT – IV **8L**

Condensation And Boiling : Introduction to condensation phenomena; heat transfer relations for laminar film. Condensation on vertical surfaces and on a horizontal tube; Boiling modes pool boiling curve.

Heat Exchanger: Types of heat exchangers; fouling factors; overall heat transfer coefficient; logarithmic Mean temperature difference (LMTD) method; effectiveness-NTU method; compact heat Exchangers.

Introduction To Mass Transfer: Introduction; Fick's law of diffusion, analogy between heat and mass transfer, steady mass diffusion through a wall, convective mass transfer.

UNIT – V **8L**

Thermal Radiation: Basic radiation concepts; radiation properties of surfaces; black body radiation laws; shape factor; black-body radiation exchange; Radiation exchange between non-blackbodies in an enclosure; Infinite parallel Planes, radiation shields.

Reference Books:

1. Cengel, Y.A. and Ghajar, A.J. "Heat and Mass Transfer", Tata McGraw Hill Co.Ltd, 4th edition, 2013.
2. Thirumaleswar, M."Fundamentals of Heat and Mass Transfer",Pearson Education, 1st edition, 2013.
3. Incropera, F.P., "Fundamentals of Heat & Mass Transfer", Wiley Publication, 6th edition, 2013.
4. Kreith, F. and Bohn, M.S., "Principles of Heat Transfer", Brooks/Cole, 6th edition, 2006.
5. Holman, J.P., "Heat Transfer", TataMcGraw-Hill Publishing Company Limited, 6th edition, 2008.

Heat and Mass Transfer Lab : List of Experiments

1. Conduction - Composite wall experiment.
2. Convection - Experiment on heat transfer from tube-natural convection.
3. Convection - Heat transfer through fin-natural convection.
4. Convection - Heat transfer through fin-forced convection.
5. Convection- Heat transfer from forced convection from tube.
6. Heat exchanger - Parallel flow experiment.
8. Heat exchanger - Counter flow experiment.
9. Conduction - Determination of thermal conductivity of metal.
10. Determination of Stefan-Boltzman constant.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Mechanical Measurements**	Course Code: **LA5230**
Credit: 4.5	L **3** T **1** P **2**
Year: **3rd**	Semester: **V**

UNIT – I **6L**

Basic Concepts of Measurements: Introduction to measurement and measuring instruments, Generalized measuring system and functional elements, units of measurement, static and dynamic performance characteristics of measurement devices, calibration, standards of measurements, concept of error, sources of error, statistical analysis of errors.

Sensors and Transducers: Types of sensors, types of transducers and their characteristics.

Signal transmission and processing: Devices and systems. Signal Display & Recording Devices

UNIT – II **9L**

Strain measurement: Types of strain gauges and their working, strain gauge circuits, temperature compensation. Strain rosettes, calibration.

Measurements of force and torque: Different types of load cells, elastic transducers, pneumatic & hydraulic systems.

Vibration Measurement: Seismic instruments, vibration pickups and decibel meters, vibrometers accelerometers.

UNIT – III **9L**

Angular and Taper Measurements: Introduction; Working principle & construction of Angular Measuring

Instruments like Protractors, Sine bars, Sine Centre, Angle gauges, Spirit level, Clinometers, angle dekkor; Applications, Advantages & limitations of commonly used angular measuring instruments; Taper Measuring instruments: Measurement of taper shafts & holes.

UNIT – IV **8L**

Screw Thread Measurements: Introduction & classification of Threads; Elements, Specification & forms of Screw Threads; Various Methods for measuring elements of External & Internal Screw Thread; Screw Thread Gauges; Errors in Threads.

Gear Measurements: Measurement and testing of spur gear: Various methods of measuring tooth thickness, tooth profile & pitch; Gear Errors.

UNIT – V **8L**

Temperature Measurement: Introduction; Temperature and Temperature Scales; Methods of temperature Measurement; Expansion thermometers; Filled System thermometers; Electrical temperature measuring instrument; Pyrometers; Calibration of temperature measuring instruments.

Pressure Measurement: Introduction; Pressure standards and methods of pressure measurement;

Manometers; Elastic pressure transducers; Measurement of Vacuum; Force balance pressure gauges; Electrical pressure transducers; pressure

Switches; Calibration of pressure measuring instruments, Maintenance and repair of pressure measuring instrument; Trouble shooting.

Reference Books:

1. R.K. Rajput, "Mechanical Measurements & Instruments", 3rd edition, 2007-2008
2. Beckwith, Marangoni, Lienhard, "Mechanical Measurements", 5th edition, 2003
3. A.K. Sawhney and P. Sawhney, "Mechanical Measurements and Instrumentation", 12th edition, 2001
4. Doeblin, "Measurement Systems", 5th edition, 2004

MECHANICAL MEASUREMENTS LAB

List of Experiments

1. Study & working of simple measuring instruments- Vernier calipers, micrometer,tachometer.
2. Measurement of effective diameter of a screw thread using 3 wire method.
3. Measurement of angle using sinebar & slip gauges. Study of limit gauges.
4. Study & angular measurement using level protector.
5. Study of dial indicator & its constructional details.
6. Study and understanding of limits, fits & tolerances.
7. Study of Pressure & Temperature measuring equipments.
8. Strain gauge measurement.
9. Speed measurement using stroboscope.
10. Flow measurement experiment.
11. Vibration/work measuring experiment.
12. Experiment on Dynamometer

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Industrial Engineering & Management**	Course Code: **LA5010**
Credit: 3	L **3** T **0** P **0**
Year: **3rd**	Semester: **V**

UNIT – I **6L**

Production, Production systems and Productivity:

Definition of production, factors of production, types of production systems. Definition of productivity, application and advantages of productivity, Improvement tools, reasons for increase and decreases in productivity

UNIT – II **9L**

Location Selection and Plant Layout:

Nature of Location Decision, Importance of Plant Location, Dynamic Nature of Plant Location, Choice of site for selection, State regulations on location, Government policies on decentralization. Industrial Estates, Economic Survey of Site selection, Comparison of location,

Principles of Plant layout and Types, factors affecting layout, methods, factors governing flow pattern, travel chart, analytical tools of plant layout, layout of manufacturing shop, repair shop and services sectors.

UNIT – III **9L**

Production Planning and Control:

Types of production systems and their characteristics functions and objectives of P.P.C., product design and development including standardization and simplification,

Sales forecasting, concept, techniques, application, production planning and process planning,

Sequencing, loading and scheduling, techniques and their selection, line of balance, assembly line balancing, dispatching, progress control.

UNIT – IV **8L**

Inspection and Statistical Quality Control:

Inspection – functions, types, objectives and benefits, quality control – principles, Concepts of quality circles, Total quality management, Quality assurance, Quality audit, ISO, and six sigma.

SQC Concept, variable and attributes, normal distribution curves and its property charts for variable and attributes and their applications and interpretation (analysis) process capability, Acceptance sampling, sampling plans, OC curves and AOQ curves.

UNIT – V **8L**

Basics of Management: introduction, definition of management, functions of management – planning, organising, staffing, directing, co-ordination, controlling, motivating, communication, decision making.

Principles of management, administration and management, nature of management, levels of management, managerial skills, managerial roles, styles of management.

Forms of organisation – line, staff, line-staff

Forms of ownership – partnership, joint stock, cooperative society, govt. sector etc.

Reference Books:

1. Riggs, "Production System, Planning, Analysis and Control", Wiley, 3rd ed. 1991.
2. Mahajan, "Industrial Engineering and Production Management", Dhanpat Rai & Co., 2005.
3. Martand Telsang, "Industrial Engineering and Production Management", S.Chand & Co.,2nd ed. 2006.
4. Banga and Sharma, "Industrial Engineering and Production Management", Khanna publishers.
5. Shankar, "Industrial Engineering and Management",Galgotia Publications Pvt. Ltd, 1st ed. 2000 (Reprint 2006).
6. Khanna, "Industrial Engineering and Management", Dhanpat Rai Publications, 17th edition 2010.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Machine Design–II**	Course Code: **LA5020**
Credit: 3.5	L **3** T **1** P **0**
Year: **3rd**	Semester: **V**

UNIT – I **8L**

Spur Gear: Tooth forms, System of gear teeth, contact ratio, Standard proportions of gear systems, Interference in involute gears, Backlash, Selection of gear materials, Gear manufacturing methods, Design considerations, Beam strength of gear tooth, Dynamic tooth load, Wear strength of gear tooth, Failure of gear tooth, Design of spur gears, AGMA and Indian standards.

UNIT – II **8L**

Helical Gear: Terminology, Proportions for helical gear, Beam strength and wear strength of helical gear, herringbone gear, crossed helical gear, Design of helical gears.

Worm Gear: Types of worm, Terminology, Gear tooth proportions, Efficiency of worm gear, Heat dissipation in worm gearing, Strength and wear tooth load for worm gear, Design of worm gearing.

UNIT – III **8L**

Sliding Contact Bearing Types, Selection of bearing, Plain journal bearing, Hydrodynamic lubrication, Properties and materials, Lubricants, Hydrodynamic journal bearing, Heat generation, Design of journal bearing, Thrust bearing-pivot and collar bearing, Hydrodynamic thrust bearing.

UNIT – IV **8L**

Rolling Contact Bearing Advantages and disadvantages, Types of ball bearing, Thrust ball bearing, Types of roller bearing, Selection of radial ball bearing, Bearing life, Selection of roller bearings, Dynamic equivalent load for roller contact bearing under constant and variable loading, Reliability of Bearing, Selection of rolling contact bearing, Lubrication of ball and roller bearing, Mounting of bearing.

UNIT – V **8L**

I. C. Engine parts

Selection of type of IC engine, General design considerations, Design of Cylinder and cylinder head; Design of piston, piston ring and gudgeon pin; Design of connecting rod; Design of center crankshaft.

Reference Books:

1. Waldron M.B. & Waldron K.J., "Mechanical Design Theory and Methodology" Springer India, 2nd Edition 2007.
2. Juvinall Robert C. "Machine Design" Wiley Publication, India, 5th Edition 2011
3. Spott M. F "Design of Machine Elements" Prentice Hall India, 3rd Edition 2013
4. Sharma and Agrawal "Machine Design" S.K. Katara & Sons, 1st Publication 1997.
5. Bhandari V. B."Design of Machine Elements" Tata McGraw Hill Co., 3rd Edition 2013.
6. Gitin M. Maitra "Handbook of Gear Design" Tata McGraw Hill Co., 2nd Edition 1994.
7. Alex Vallance & Doughtie V.I. "Design of Machine Members" Tata McGraw Hill Co., 4th Edition 1964.
8. Black P. H. & Adams O. E. "Design of Machine Elements" Tata McGraw Hill Co., 3rd Edition 1968.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Internal Combustion Engines**	Course Code: **LA6210**
Credit: 4.5	L **3** T **1** P **2**
Year: **3rd**	Semester: **VI**

UNIT – I **9L**

Introduction to I.C Engines: Engine classification, Air standard cycles, Otto, Diesel, Stirling, Ericsson cycles, Actual Cycle analysis, Two and four stroke engines, SI and CI engines, Valve timing diagram, Rotary engines, Stratified charge engine.

Fuels: Fuels for SI and CI engine , important qualities of SI engine fuels, Rating of SI engine fuels, Important qualities of CI engine fuels, Dopes, Additives, Gaseous fuels, LPG, CNG, Biogas, Producer gas, Alternative fuels for IC engines.

UNIT – II **9L**

SI Engines: Carburetion, Mixture requirements, Carburetor types Theory of carburetor, MPFI. Combustion in SI engine, Flame speed, Ignition delay, Abnormal combustion and it's control, Combustion chamber design for SI engines.

Ignition system requirements, Magneto and Battery ignition systems, Ignition timing and spark plug, Electronic ignition, Battery and its types, Charging and discharging of batteries.

UNIT – III **8L**

CI Engines: Fuel injection in CI engines, Requirements, Types of injection systems, Fuel pumps, Fuel injectors, Injection timings.

Combustion in CI engines, Ignition delay, Knock and its control, Combustion chamber design of CI engines.

Scavenging in 2 Stroke engines, Pollution and its control.

UNIT – IV **9L**

Engine Cooling: Different cooling systems, Cooling Towers, Radiators and cooling fans.

Lubrication: Engine friction, Lubrication principal, Type of lubrication, Lubrication Oils, Crankcase ventilation.

Supercharging: Effect of altitude on power output, Types of supercharging.

UNIT – V **7L**

Testing and Performance: Performance parameters, Basic measurements, Blow by measurement, Testing of SI and CI engines. Heat balance sheet.

Reference Books:

1. V. Ganesan, "Internal Combustion Engines", Tata Mc Graw Hill Publishers, 4th Edition.
2.M.L.Mathur & R.P.Sharma, "A Course in International Combustion Engines", Dhanpat Rai & Sons.4th Ed, 2005.
3. R. K. Rajput, "A A Textbook of Internal Combustion Engines", Laxmi Publication, 2nd edition, 2005 .
4.Colin R.Ferguson, Allan Thomson Kirkpatrick, "Internal combustion engines" John Wiley & Sons, 2nd ed, 2000.

Internal Combustion EnginesLab : List of Experiments

1. Study & experiment on 2- Stroke diesel and diesel engine.
2. Study & experiment on 4- Stroke petrol and diesel engine.
3. Performance Analysis of Four stroke S.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.
4. Determination of Indicated H.P. of I.C. Engine by Morse Test.
5. Performance Analysis of Four stroke C.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.
6. Study & experiment on Ignition system of I.C. Engine.
7. Study & experiment on Fuel Supply System of S.I. Engines- Carburetor, Fuel Injection Pump and MPFI.
8. Study & experiment on Fuel Supply System of C.I. Engines- Injector & Fuel Pump.
9. Experiment on Exhaust Gas Analysis of an I.C. Engine.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Computer Aided Design (CAD)**	Course Code: **LA6220**
Credit: 4.5	L **3** T **1** P **2**
Year: **3rd**	Semester: **VI**

UNIT – I **8L**

Fundamentals of CAD:

Introduction, Reasons for implementing a CAD system, Computer Aided Process application, conventional design vs CAD. Benefits, Hardware, CAD software's, review of c, c++ , statement such as if else for while and switch, functions, pointer-notations, structure and class, concept of oops.

Computer graphics

Graphics input devices-cursor control devices,digitizers,scanners and touch panels,

Graphics display devices: CRT, colour CRT monitors,DVST,Flat panel display,graphics output devices

UNIT – II **9L**

Geometric modeling:

Graphics functions, output-primitives- bresenham's line drawing and mid point circle algorithms, Types of mathematical representation of curves, wire frame models, wireframe entities,parametric representation of synthetic curves- her mite cubic splines, Bezier curves ,B-splines rational curves

Surface modeling: Mathematical representation surfaces, Surface model, Surface entities, surface representation, Parametric representation of surfaces, plane surface, rule surface, surface of revolution, Tabulated Cylinder

UNIT – III **9L**

Parameteric representation of synthetic surfaces–:

Hermite Bicubic surface, Bezier surface, B- Spline surface, COONs surface, Blending surface , Sculptured surface, Surface manipulation – Displaying, Segmentation, Trimming, Intersection, Transformations (both 2D and 3D).

Geometric Modelling-3D : Solid modeling, Solid Representation, Boundary Representation (B-rep), Constructive Solid Geometry (CSG),quadric and superquadric surfaces and blobby objects

Graphics Standards: Standards for graphics programming, features of GKS, other graphics standards, PHIGS, IGES, PDES. Standards in CAD

UNIT – IV **8L**

Collaborative Engineering: Collaborative Design, Principles, Approaches, Tools, Design Systems. Introduction to CAD/CAE, Element of CAD, Concepts of integrated CAD/CAM, CAD Engineering applications, its importance & necessity.

Finite Element Methods: Introduction and Application of FEM, Stiffness Matrix/ Displacement Matrix, One/Two Dimensional bar & beam element (as spring system) analysis

UNIT – V **7L**

Optimization:

Introduction, design synthesis, Engineering vs Optimum Design, Objectives of Optimization, Classification of Optimization problems and their procedure, techniques of optimization, Optimized design of machine components, Optimization Software.

Reference Books:

1. Ibrahim Zeid "CAD/Cam Theory and Practice", McGraw Hill, International Edition, 1998.
2. Chris McMohan and Jimmi Browne, "CAD/CAM Principles, Practice and Manufacturing Management", Pearson Education Asia Ltd., 2000.
3. Donald Hearn and Pauline Baker M. "Computer Graphics", Prentice Hall, Inc., 1992
4. Khandare S.S., "Computer Aided Design", Charotar Publishing House, India, 2001.
5. Newman, William M., & Sproull, Robert F., "Principles of Interactive Computer Graphics", 2nd Ed., McGraw Hill, 1981.
6. Harington, Stevan, "Computer Graphics: A Programming Approach", McGraw Hill, 1983.
7. Plastock, Roy A., & Kally, "Theory and Problems of Computer Graphics", McGraw Hill, 1986.
8. Rogers. D.F., "Procedural Elements for Computer Graphics", McGraw Hill, 1985.
9. Foley, J.D. & Van dam, A., "Fundamentals of Interactive Computer Graphics", AddisonWesley, 1982.
10. Vosinet, Donald., "Computer Aided Drafting and Design: Concepts & Applications", McGraw Hill, 1986

COMPUTER AIDED DESIGN LAB

List of Experiments

1. Line Drawing or Circle Drawing experiment: Writing and validation of computer program.
2. Geometric Transformation algorithm experiment for translation/rotation/scaling: Writing and validation of computer program.
3. Design of machine component or other system experiment: Writing and validation of computer program.
4. Understanding and use of any 3-D Modeling Software commands.
5. Pro/E/Idea etc. Experiment: Solid modeling of a machine component
6. Writing a small program for FEM for 2 spring system and validation of program or using a fem Package
7. Root findings or curve fitting experiment: Writing and validation of computer program.
8. Numerical differentiation or numerical integration experiment: Writing and validation of computer program.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Refrigeration and Air Conditioning**	Course Code: **LA6230**
Credit: 4.5	L **3** T **1** P **2**
Year: **3rd**	Semester: **VI**

UNIT – I **8L**

Introduction: Principles and methods of refrigeration; reverse Carnot cycle; unit of refrigeration; coefficient of performance (COP)

Air refrigeration system: Classification; Bell Coleman cycle; Open and closed air refrigeration cycles; Simple, Boot-strap, reduced ambient and regenerative cooling systems; Dry air rated temperature (D.A.R.T).

UNIT – II **7L**

Vapour compression system (single stage): Vapour compression cycle, p-h and t-s diagrams; deviations from theoretical cycle; Effects of sub-cooling and super heating, condenser and evaporator pressure on system performance.

Refrigerants: Nomenclature & classification; desirable properties; common refrigerants- comparative study; leak detection methods; Secondary refrigerants; Environment friendly & CFC free refrigerant.

UNIT – III **7L**

Vapour compression system (multi stage): Removal of flash gas; multiple expansion & compression with flash inter cooling.

Vapour absorption system: Theoretical and practical systems such as aqua-ammonia, Lithium bromide-water & Electrolux absorption systems; Binary mixture; Temperature-concentration, Enthalpy-concentration diagrams.

UNIT – IV **8L**

Psychrometry: Psychrometric properties and their definitions; psychrometric processes: sensible heating and cooling, evaporative cooling, cooling and dehumidification, adiabatic dehumidification, heating and humidification; adiabatic saturation temperature; mixing of air stream, sensible heat factor (SHF), apparatus dew point (ADP), bypass factor of coil;

Applied Psychrometry: Air washer, cooling tower.

UNIT – V **10L**

Principle of air conditioning: Requirements of comfort air conditioning; thermal analysis of human body; human comfort, effective temperature & chart.

Air-conditioning loads: Basic knowledge of summer & winter air conditioning load; calculation of supply air rate & its condition; ventilation and infiltration, room sensible heat factor (RSHF), grand sensible heat factor (GSHF), effective sensible heat factor (ESHF).

Text Books:

6. Arora, S.C. and Domkundwar, S."**Refrigeration & Air-Conditioning"**; Dhanpat Rai & Co. (P) Ltd.; Nai Sarak Delhi, 2013 edition.

Reference Books:

1. Arora, C.P.,**"Refrigeration & Air-Conditioning"**; McGraw-Hill Education (India) Pvt. Ltd., New Delhi-110016, 3rd Edition, 2008.
2. Roy J. Dossat. **"Refrigeration & Air-Conditioning"**; Pearson Education.
3. Stoecker, W., Jones, J.,**"Refrigeration & Air-Conditioning"**; McGraw-Hill; New Delhi
4. Khurmi, R. S. and Gupta, J. K., **"Refrigeration & Air-Conditioning"**; S Chand and Company Ltd.; New Delhi, 5th Edition, 2011.
5. Rajput, R.K.,"**Refrigeration & Air-Conditioning"**; S.K. Kataria and Sons; New Delhi-110002, 2nd Edition, 2012.
6. Arora, Ramesh Chandra,"**Refrigeration & Air-Conditioning"**; PHI Learning Private Ltd.; New Delhi (2012).
7. ASHRAE Handbook.

Refrigeration and Air Conditioning Lab

List of Experiments

1. Experiment on refrigeration test ring and calculation of various performance parameters.
2. To study different types of expansion devices used in refrigeration system.
3. To study different types of evaporators used in refrigeration systems.
4. To study basic components of air-conditioning system.
5. Experiment on air-conditioning test rig & calculation of various performance parameters.
6. To study air washers.
7. Study of window air conditioner.
8. Study & determination of volumetric efficiency of compressor.
9. Visit of a central air conditioning plant.
10. Visit of cold storage.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Operation Research**	Course Code: **LA6010**
Credit: 3.5	L **3** T **1** P **0**
Year: **3rd**	Semester: **VI**

UNIT – I **11L**

Introduction: Linear programming, Definition, scope of Operations Research, approach and limitations. Models, Characteristics and phases of O.R., Mathematical formulation of L.P. Problems. Graphical solution methods.

Linear Programming Problems: The simplex method - slack, surplus and artificial variables. Concept of duality, two phase method, dual simplex method, degeneracy, and procedure for resolving degenerate cases.

UNIT – II **11L**

Transportation Problem: Formulation of transportation model, Basic feasible solution using different methods, Optimality, Methods, Unbalanced transportation problem, Degeneracy in transportation problems, Applications of Transportation problems.

Assignment Problem: Formulation, unbalanced assignment problem, traveling problem.

UNIT – III **7L**

Game Theory: Formulation of games, two person-Zero sum game, games with and without saddle point, Graphical solution (2x n, m x 2 game), and dominance property.

UNIT – IV **7L**

Queuing Theory: Queuing system and their characteristics. The M/M/1 Queuing system, Steady state performance analysis of M/M/ 1 and M/M/C queuing model.

UNIT – V **8L**

PERT-CPM Techniques: Network construction, determining critical path, floats, scheduling by network, project duration, variance under probabilistic models, prediction of date of completion, crashing of simple networks.

Reference Books:

1) J.K. Sharma; Operation Research; Theory and application, 5th edition, 2013.
2) A.M. Natrajan, P. Balsubramani, A. Tamil Aravari, Operation Research; 4th edition, 2005.
3) Taha H.A.; Operation Research; Pearson; 8th edition, 2008.
4) Vivek Kumar; Operation Research; Katson Books, 5th edition, 2012.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Engineering Economics**	Course Code: **GC5010**
Credit: 2	L **2** T **0** P **0**
Year: **3rd**	Semester: **VI**

UNIT – I **8L**

Time value of money, simple interest vs. compound interest, cash flow diagrams, future value and compounding, present value and discounting, uneven cash flow and annuity, calculate present worth, future worth and annual worth, discounted cash flow valuation, effective interest rate, annual percentage rate, multi period interest, continuous compounding, capital recovery and sinking fund model.

UNIT – II **6L**

Analysis of public Projects: Use and situations for equivalent annual worth comparison, Comparison of assets of equal and unequal life. Benefit/ Cost analysis, quantification of project, cost and benefits, benefit/ cost applications, Cost –effectiveness analysis.

UNIT – III **6L**

Investment Decisions: Techniques of capital budgeting, payback period, discounting payback period, NPV Vs IRR comparison Rate of return, internal rate of return, comparison of IIR with other methods, IRR Misconceptions.

UNIT – IV **6L**

Indian capital Market: Structure, efficiency and forms of capital market efficiency, Primary market and capital market, Exposure on trading of various types of security instruments i.e. Equity shares, Mutual funds etc.

Reference Books:

1. Horn gren, C.T., **Cost Accounting**, Prentice Hall of India
2. White, **Engineering Economics**, Wiley India
3. Riggs, J.L., Dedworth, Bedworth, D.B, Randhawa, S.U., **Engineering Economics**, McGraw Hill International Edition, 1996
4. Rustagi R.P. - GalgotiaPublications
5. **Contemporary Engineering Economics**, Third Edition by Chan S. Park, 2002, Prentice Hall.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Computer Integrated Manufacturing**	Course Code: **LA7210**
Credit: 4	L **3** T **0** P **2**
Year: **4th**	Semester: **VII**

UNIT – I **8L**

Introduction- Concepts of CIM, Manufacturing system, components of CIM, CASA/SME model of CIM, CIM II, Benefits of CIM, Communication matrix in CIM, Fundamentals of computer communication in CIM, computer networking in CIM- seven layers of OSI model.

UNIT – II **8L**

NC & CNC part programming: Fundamental of NC technology, computer numerical control, distributed numerical control, coding systems and formats**,** Manual NC part programming, Examples drilling and milling, turning, CNC machines and turning centers, CNC part programming.

UNIT – III **8L**

Material Handling System -introduction to material handling, material transport equipment like industrial trucks, automated guided vehicles, monorail and other rail guided vehicles, conveyors, cranes and hoists.AS/RS design process

Identification technologies- introduction, bar code technology, radio frequency identification.

UNIT – IV **7L**

Flexible manufacturing systems: introduction, FMS components, equipments, FMS tool management systems, system layout, FMS control, case study. FMS applications and benefits.

Group technology and cellular Manufacturing: part families, part classification and coding Production flow analysis, application of Group technology.

UNIT – V **8L**

Process planning and Concurrent Engineering- process planning, computer aided process planning, concurrent engineering and design for manufacturing, advance manufacturing planning,

Production Planning and Control systems- Aggregate production planning and the Master Production schedule, Material Requirement planning, Shop floor control, Inventory control,
JUST IN TIME, Lean and Agile manufacturing

References Books:

1. Groover. Mikell P, "Automation, Production systems and computer integrated manufacturing", Third edition, PHI learning private limited, ISBN-978-81-203-3418-2.
2. Rao P N ,"CAD/CAM Principles and Applications "third edition, McGraw Hill Education Pvt.Ltd.ISBN-978-0-07-068193-4
3. Groover .Mikell P and Zimmers jr. Emory, "CAD/CAM", Prentice hall of India Pvt Ltd., 1998.
4. James A, Regh and Henry W. Kreabber "Computer integrated manufacturing" Pearson Education 2nd ed, 2005.
5. Paul G. Ranky., " Computer Integrated Manufacturing", Prentice hall of India Pvt Ltd., 2005

List of Experiments

1. Study of Flexible manufacturing system
2. Writing a part-programming (in word address format or in APT) for a job for drilling operation (point-to-point) and running on NC machine.
3. Writing a part programming (in word address format or in APT) for a job for milling operation (contouring) and running on NC machine
4. Experiment on Robots and it programs
5. Experiment on Transfer line/Material handling.
6. Experiment on difference between ordinary machine and NC machine
7. Study of retrofitting.
8. Experiment on study of system devices such as motors and feedback devices.
9. Experiment on Mechatronics & controls

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Automobile Engineering**	Course Code: **LA7220**
Credit: 4.5	L **3** T **1** P **2**
Year: **4th**	Semester: **VII**

UNIT – I **13L**

Introduction: Classification of automobiles, Parts of an automobile, Description of an automobile, performance of automobile, engine cycle-energy balance, performance parameters, tractive efforts.

Fuel-supply system:

S.I. engine: Carburetion & carburetors, factor influencing carburetion, Mixture requirement, Distribution, Complete carburetor, theory of simple carburetor.

C.I. engine: Functional requirements of an injection system, Fuel pump and fuel injector (Atomizer), Types of nozzles and fuel spray patterns. Turbo Charger.

MPFI: Introduction and functioning

UNIT – II **8L**

Engine friction, lubrication & cooling system: Determination of engine friction, lubrication system, crankcase ventilation, necessity of engine cooling, areas of heat flow in engines, gas temperature variation, heat transfer, temperature distribution & temp. Profiles, cooling air and water requirements, cooling systems.

UNIT – III **6L**

Chassis: Introduction. Classification of chassis, Frame.

Suspension: Introduction, requirements of suspension system, springs, damper.

Wheels: Introduction, Requirement, types of wheels.

Tyres: Introduction, requirements, types of tyre, tyre construction-cross ply, radial ply, belted bias, tyre materials tyre shape, tread patterns,, wheel balancing, wheel alignments.

UNIT – IV **10L**

Steering and gears: Purpose, function, requirements, general arrangements of steering systems, steering gears, steering ratio, reversibility, steering geometry, under steering, over steering, steering arms, Drag link, power steering, adjusting of steering geometry, steering troubleshooting. Requirements. Clutches. Toque converters. Over drive and free wheel, Universal joint. Differential Gear .Mechanism of Rear Axle. Automatic transmission, Steering and Front Axle. Castor Angle.

Front axle: Introduction, construction, types of front axles, stub axles.

Braking system: Necessity, functions, requirements, classification of brakes, Mechanical brakes, hydraulics brakes, power brakes, brake service, air brakes & Brake shoes & drums.

UNIT – V **7L**

Automotive electrical system: Introduction, main parts of vehicles.

Starting system: Introduction, battery, starting motor.

Ignition system: Introduction, purpose, requirements, coil ignition system, firing order, ignition timing, spark plugs, digital ignition.

Charging system: Introduction. Dynamo, alternators.

Lighting: introduction, main circuits, lighting system.

References Books:

1. Crouse,W.L. and Anglin, D.L., "Automotive Mechanics", Tata McGraw Hill, New Delhi, 2005.
2. Gupta, K.N., "Automobile Engineering", Umesh Publication, 3rd Edition, 2008.
3. Singh, K., "Automobile Engineering", Standard Publication, 13th Edition, 2011.

LIST OF EXPERIMENTS

1. Study of braking system of an automobile.
2. Study of steering system of an automobile.
3. Study of Fuel supply system of an automobile.
4. Study of Suspension system of an automobile.
5. Heat balance sheet of diesel engine test rig.
6. Morse's test.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Power Plant Engineering**	Course Code: **LA7030**
Credit: 3	L **3** T **0** P **0**
Year: **4th**	Semester: **VII**

UNIT – I **7L**

Introduction: economics of power generation: - Introduction, Power and energy, sources of energy, load duration curves, power plant economics, tariff methods for electrical energy

Combustion of fuels: Combustion chemistry, Conversion of volumetric to weight analysis and vice-versa, Weight of air required for complete combustion of fuel, excess air, weight of carbon in flue gases, Weight of flue gas per kg of fuel burnt.

UNIT – II **7L**

Analysis of Rankine cycle: characteristics of ideal working fluid for vapour power cycle**,** Rankine cycle and layout of power plant consists of economizer, evaporator, and super heater, effect of superheat, effect of inlet pressure, effect of reheater, effect of regeneration, effect of variation of steam condition on thermal efficiency of steam power plant, feed water heater, deaerator, carnotization of Rankine cycle, efficiency in a steam power plant.

Pulverized coal firing system: crushers and pulveriser, fluidized bed combustion and boiler: regime of fluidization, bubbling fluidized bed boilers, circulating fluidized bed boilers, circulation, Steam Drum and Internals Parts, Electrostatic Precipitator, Condenser and cooling water system , Cooling Towers.

UNIT – III **7L**

Diesel power plant: General layout, performance of diesel engine, fuel system, lubrication system, air intake and admission system, supercharging system, exhaust system, diesel plant operation and efficiency, heat balance.

Gas turbine power plant: Components of gas turbine power plants, Classification and comparison of different gas turbine power plants, Analysis of closed cycle and open cycle constant pressure gas turbine plants, methods to improve the thermal efficiency of a simple open cycle constant pressure gas turbine power plant. Advantage of Gas turbine plant over Diesel and Thermal Power Plants. Combined cycle power plants.

UNIT – IV **5L**

Hydro electric Power Plant: Hydrology and hydrographs, Flow duration curves,Principles of working, applications, site selection, classification and arrangements of hydroelectric plants.

UNIT – V **7L**

Nuclear power plant: Introduction, Types of Nuclear Reactions, Principles of nuclear energy, nuclear power station. Nuclear fuels in fission and fusion reactors, Nuclear materials, Neutron chain reaction in fission reactors, Neutron flux.

Nuclear reactors: Components: Coolants, Moderators, Reflector, Control rods, Shielding and structural materials. Different Types of Reactors and their comparison, Location of Nuclear Power Plant.

Reference Books:

1. Nag.P.K, "Power Plant Engineering", 2nd edition, Tata McGraw Hill, 2002.ISBN-0-07-043599-5.
2. Dornkundwar, Arora, "Power Plant Engineering", Dhanpat Rai & Sons
3. Rajput. R.J., "A text book of Power Plant Engineering", Laxmi Publications 2005 New Delhi.
4. Sharma.P.C., " Power Plant Engineering"; 9th edition; S.K. Kataria & Sons.
5. Ram.K.S. "Basic Nuclear Engineering"; Wiley publication .

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Total Quality Management**	Course Code: **LA7010**
Credit: 3	L **3** T **0** P **0**
Year: **4th**	Semester: **VII**

UNIT – I **8L**

Introduction, Need for quality, Evolution of quality, Definition of quality, Dimensions of manufacturing and service quality, Basic concepts of TQM, Definition of TQM,TQM Framework, Contributions of Deming, Juran and Crosby, Barriers to TQM.

UNIT – II **8L**

Process Control & Product Control, Concept of control charts, variables & attributes control chart for variables & attributes Acceptance Sampling and Sample Plans

UNIT – III **8L**

Concept of reliability, maintainability and availability. Bath tub curve, MTTF, MTTR, Zero Defect

UNIT – IV **8L**

The seven traditional tools of quality, New management tools, Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT, Bench marking. Reason to bench mark, Bench marking process, FMEA, Stages, Types. Deming Cycle, 5S Techniques, Kaizen

UNIT – V **8L**

Quality circles, Quality Function Deployment (QFD), Taguchi quality loss function, TPM – Concepts, Concept of Cost of Quality

Text Book:

1. Dale H. Besterfiled, et at., "Total Quality Management", Pearson Education Asia, Third Edition, Indian Reprint (2006).

Reference Books:

1. Quality Management by Kanishka Bedi – Oxford University press First Edition 2008
2. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 6th Edition, South-Western (Thomson Learning), 2005.
3. Oakland, J.S. "TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, 3rd Edition, 2003.
4. Suganthi, L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
5. Janakiraman, B and Gopal, R.K, "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.
6. Total Quality Management by Shri Dhara Bhatt K.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Industrial Automation & Robotics**	Course Code: **LA7020**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VII**

UNIT – I **6L**

Automation: Introduction, Element of Automation, Types of automation, Advantages and limitations of Automation, Low cost Automation, and Current emphases in Automation.

Fluid power: Introduction of hydraulics and Pneumatics fluid, Basic elements of fluid power system, Application of fluid power, Pneumatics vs. Hydraulics. Advantage and disadvantages.

UNIT – II **10L**

Pump and Compressors: Introduction, Pumps vs. Compressors, Classification of Hydraulic Pumps, Air compressors, Types of air compressors

Fluid Accessories: Introduction, Pneumatic accessories, hydraulic accessories like Air receiver, After cooler, Air dryer, Air filter, Pressure regulator. Air lubricator Air service unit (F.R.L) Pipeline layout. Seals, Hydraulic reservoir, Hydraulic filter. Pressure gauges and volume meters, Hydraulic accumulator, Hydraulic seals.

Cylinders and Motors-Introduction, Classification of cylinders. Applications, Cylinder cushioning, Cylinders mountings, Cylinder sizing, Cylinder specification, Introduction to motors, Motor ratings, Hydraulic and pneumatic motors, Symbol of motors, Classification of motors.

UNIT – III **10L**

Control valves. Introduction, Classification of valves. Direction control valves, flow control valves, pressure control valves, check valves, servo valves.

Hydraulic Pneumatic Circuits- Introduction, hydraulic and pneumatic symbols, comparison of hydraulic, pneumatic and Hydro pneumatic systems, hydraulic circuits and its design, meter in circuits, meter out circuits, bleed off circuits, accumulator circuits, sequencing circuits, hydraulic circuit for robot arm, circuit design for control of single and double acting cylinder, Open and Closed loop, Control system Circuit design Methods, Motion sequence representation.

Transfer devices and feeders: Introduction, Fundamentals of production lines, Types of assembly lines, Transfer systems in assembly lines, Automatic machines, Transfer Devices/ Machines, Classification of transfer devices, Conveyor systems used in transfer devices, Feeders, Classification of feeders, Types of feeders.

UNIT – IV **6L**

Fundamentals of Robot- Definition, Laws of Robotics, Motivating Factors, objective of using industrial Robot, Advantages and Disadvantages of Robots, Characteristics of an Industrial Robot, Components of an Industrial Robot, Robot Wrist and Robot Terminology, Robotics mechanical Joints, Classification of industrial Robots, Robot control systems, Type of controller used in Robotics,

Robot cell layout, work cell Control, interlocks, Error detection and recovery.

UNIT – V **8L**

Robotics sensors- Types of sensors used in robotics, touch or tactile sensors, position and displacement sensors, force and torque sensors , proximity sensors, types of proximity sensors, range sensors, selection of right sensor.

Robot End Effectors- Types of end effectors, mechanical grippers, vacuum grippers, magnetic grippers, adhesive grippers, force analysis of gripper mechanism, remote center compliance devices (RCCs).

Robot programming- Introduction, Robot Programming, Method of robot programming Robot Programming, Overview of Robot Programming Languages, Robot Languages, Types of Robot Languages, Robot Capabilities, Applications of Robots.

Reference Books:

1. Gupta .A.K , "Industrial Automation And Robotics ", 2nd editions, Laxmi Publications (P)Ltd, ISBN-8131805921
2. Rajput R. K., "Robotics And Industrial Automation", S. Chand Publisher, 2010, ISBN 10: 8121929970 / ISBN 13: 9788121929974
3. Groover. Mikell P, "Industrial Robotics Technology, Programming and Applications", McGraw Hill Publications, ISBN-0-07-100442-4.
4. Mikel P. Groover "Automation, Production Systems and Computer Integrated Manufacturing", Third edition, PHI Learning private limited, ISBN- 978-81-203-3418-2.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Maintenance Engineering & Management**	Course Code: **LA7610**
Credit: 3.0	L **3** T **0** P **0**
Year: **4th**	Semester: **VII**

Unit-I
Introduction, operating life cycle, reliability, Failure data analysis, failure rate curve, hazard models, elements in series, parallel, mix, logic diagrams, improving reliability, redundancy element, unit, standby, maintainability, availability, reliability and maintainability trade off. **8**

Unit-II
Maintenance Strategies: Break down maintenance, planned maintenance, strategies, preventive maintenance, design out maintenance, planned lubrication, total productive maintenance, zero break down, preventive inspection of equipment used in emergency. **8**

Unit-III
Replacement planning maintain or replace decision, replacement of items that deteriorate identical equipment, replacement of items that fail without deterioration individual, group replacement, replacement in anticipation of failure. **8**

Unit-IV
Break down maintenance planning, assignment model, waiting time models expected waiting time, minimum cost service rate. **8**

Unit-V
Maintenance Management, production maintenance system, objectives and functions, forms, policy, planning, organization, economics of maintenance, manpower planning, materials planning, spare parts planning and control, evaluation of maintenance management. **8**

Books and References:
1. Management of systems – R.N. Nauhria& R. Prakash.
2. Operations Research – Wangner.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Fuel, Combustion and Environment**	Course Code: **LA7620**
Credit: 3.0	L **3** T **0** P **0**
Year: **4th**	Semester: **VII**

UNIT I

FUELS: Detailed classification – Conventional and Unconventional Solid, Liquid, gaseous fuels and nuclear fuels – Origin of Coal – Analysis of coal. Coal – Carborisation, Gasification and liquification – Lignite: petroleum-based fuels – problems associated with very low calorific value gases: Coal Gas – Blast Furnace Gas Alcohols and Biogas.

UNIT II

PRINCIPLES OF COMBUSTION: Chemical composition – Flue gas analysis – dew point of products – Combustion stoichiometry. Chemical kinetics – Rate of reaction – Reaction order Molecularity – Zeroth, first, second and third order reactions - complex reactions – chain reactions. Theories of reaction Kinetics – General oxidation behavior of HC's.

UNIT III

THERMODYNAMICS OF COMBUSTION: Enthalpy of formation – Heating value of fuel – Adiabatic flame Temperature – Equilibrium composition of gaseous mixtures.

LAMINAR AND TURBULENT FLAMES PROPAGATION AND STRUCTURE: Flame stability – Burning velocity of fuels – Measurement of burning velocity – factors affecting the burning velocity. Combustion of fuel, droplets and sprays – Combustion systems – Pulverized fuel furnaces – fixed, Entrained and Fluidised Bed Systems.

UNIT IV

ENVIRONMENTAL CONSIDERATIONS: Air pollution – Effects on Environment, Human Health etc. Principal pollutants – Legislative Measures – Methods of Emission control.

ENERGY AUDITS: Introduction and Procedure

REFERENCES:

1. Combustion Fundamentals / Roger A strehlow / Mc Graw Hill
2. Fuels and combustion / Sharma and Chander Mohan/ Tata Mc Graw Hill
3. Combustion Engineering and Fuel Technology / Shaha A.K./ Oxford and IBH.
4. Principles of Combustion / Kanneth K.Kuo/ Wiley and Sons.
5. Combustion / Sarkar / Mc. Graw Hill.
6. An Introduction to Combustion / Stephen R. Turns/ Mc. Graw Hill International Edition.
7. Combustion Engineering / Gary L. Berman & Kenneth W. Ragland/ Mc. Graw Hill I

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Solar Energy**	Course Code: **LA7630**
Credit: 3.0	L **3** T **0** P **0**
Year: **4th**	Semester: **VII**

Unit I

Introduction: Energy demand and supply, energy crisis, conventional and non-conventional energy resources, solar energy applications.

Solar Radiation: Sun, solar radiation, attenuation by atmosphere, solar radiation on earth, measurement, presentation and utilization of data. 7

Unit II

Heat Transfer Concepts: Radiation characteristics of surface and bodies, absorbance, reflectance and transmittance, selective surface, sky radiation and wind convection.

Flat Plate Collectors: General description of flat plate collectors, general characteristics, performance, short term and long-term performance, design. 7

Unit III

Focusing Collectors: General description of focusing solar collectors, concentrators, receivers and orienting systems, general characteristics, performance, materials, design.

Energy Storage: Energy storage in solar process system, different types of storages, characteristics and capacity of storage medium, solar pond. 8

Unit IV

Solar Heating and Cooling: Passive heating and cooling, nocturnal radiations, green house concept, ponds, active heating and cooling, solar water heaters, absorption cooling, combined solar heating and cooling systems, performance, economics of solar heating and cooling. 7

Unit V

Solar Process Modeling: Solar process systems and components, component models, system models.

Solar Photovoltaics: Description and principle of working, performance characteristics, efficiency of solar cells, module design, PV systems, applications. 6

Reference Books:

1. Artur V.Kilian., "Solar Collectors: Energy Conservation, Design and Applications", Nova Science Publishers Incorporated, 2009.
2. Soteris.A.Kalogiru., "Solar Energy Engineering: Processes and systems", 1st edition, Academic press, 2009.
3. K.Sukhatme, Suhas P.Sukhatme., "Solar energy: Principles of thermal collection and storage", Tata McGraw Hill publishing Co. Ltd, 8th edition, 2008.
4. Duffie, J. A. & W. A. Beckman., "Solar Engineering of Thermal Processes", 3rd edition, John Wiley & Sons, Inc., 2006.
5. H.P.Garg, J.Prakash., "Solar energy fundamentals and applications", Tata McGraw Hill publishing Co. Ltd, 2006.
6. D.Yogi Goswami, Frank Kreith, Jan F.Kreider., "Principle of solar engineering", 2nd edition, Taylor and Francis, 2nd edition, 2003.
7. G.N.Tiwari., "Solar energy: Fundamentals, Design, Modeling and Applications", CRC Press Inc., 2002.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Non-Conventional Energy Resources and Utilization**	Course Code: **LA8610**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VIII**

UNIT – I **8L**

Energy resources and their utilization: Renewable and non-renewable energy sources, energy consumption as a measure of Nation's development; strategy for meeting the future energy requirements Global and National scenarios, Prospects of renewable energy sources. Energy parameters (energy intensity, energy-GDP elasticity), Introduction to various sources of energy, Solar thermal, Photovoltaic, Water power, Wind energy, Biomass, Ocean thermal, Tidal and wave energy, Geothermal energy, Hydrogen energy systems, Fuel cell.

Solar radiations: Extra-terrestrial radiation, Spectral distribution, Solar constant, Solar radiations on earth, Measurement of solar radiations, Solar radiation geometry, Flux on a plane surface, Latitude, Declination angle, Surface azimuth angle, Hour angle, Zenith angle, Solar altitude angle expression for angle between incident beam and the normal to a plane surface (no derivation), Local apparent time, Apparent motion of sun, Day length, Solar radiation data for India.

UNIT – II **8L**

Solar energy: Solar thermal power and it's conversion, Solar collectors, Flat plate, Performance analysis of flat plate collector, Solar concentrating collectors, Types of concentrating collectors, Thermodynamic limits to concentration, Cylindrical collectors, Thermal analysis of solar collectors Tracking CPC and solar swing. Solar thermal energy storage, Different systems, Solar pond, Applications, Water heating, Space heating & cooling, Solar distillation, solar pumping, solar cooking, Greenhouses, Solar power plants Solar photovoltaic system: Photovoltaic effect, Efficiency of solar cells, Semiconductor materials for solar cells, Solar photovoltaic system, Standards of solar photovoltaic system, Applications of PV system, PV hybrid system.

UNIT – III **6L**

Biogas: Availability of bio-mass and its conversion theory Photosynthesis, Bio gas production Aerobic and anaerobic bio-conversion process, Raw materials, Properties of bio gas, Producer gas, Transportation of bio gas, bio gas plant technology &status, Community biogas plants, Problems involved in bio gas production, Bio gas applications, Biomass gasification, Energy recovery from urban waste, Power generation from liquid waste, Biomass cogeneration, Energy plantation, Fuel properties, Biomass resource development in India.

Wind energy: Properties of wind, Availability of wind energy in India, wind velocity, Wind machine fundamentals, Types of wind machines and their characteristics, Horizontal and Vertical axis wind mills, Elementary design principles, Coefficient of performance of a wind mill rotor, Aerodynamic considerations in wind mill design, Selection of a wind mill, Wind energy farms, Economic issues, Recent development. Performance and limitations of energy conversion systems

UNIT – IV **6L**

Electrochemical effects and fuel cells: Principle of operation of an acidic fuel cell, Reusable cells, Ideal fuel cells, Other types of fuel cells, Comparison between acidic and alkaline hydrogen-oxygen fuel cells, Efficiency and EMF of fuel cells, Operating characteristics of fuel cells, Advantages of fuel cell power plants, Future potential of fuel cells.

UNIT – V **8L**

Geothermal energy: Structure of earth's interior, Geothermal sites, earthquakes & volcanoes, Geothermal resources, Hot springs, Steam ejection, Principal of working, Types of geothermal station With schematic representation, Site selection for geothermal power plants. Advanced concepts, Problems associated with geothermal conversion.

Reference Books:

1. Duffie, J.A. & Beckman W.A. (2013), "*Solar Engineering of Thermal Processes"*. 4th edition. New York: John Wiley & Sons.
2. Garg, H.P. (1987), "*Advanced in Solar Energy Technology"*. 1st edition. Drdricht: Reidel Publishing Co.
3. Sukhatme, S.P. (1996), "*Solar Energy"*. 2nd edition. New Delhi: Tata McGrew Hill Company Ltd.
4. Twidell, J. & Wier T. (1986), "*Renewable energy resources"*. 2nd edition. English Language book, Society *I* E& FN Spon.
5. Bansal, N.K., Kleeman, M. & Mielee M. (1990), "*Renewable energy sources and conversion technology"*. 2nd edition. New Delhi: Tata McGrew Hill Company Ltd.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Automatic Control**			Course Code: **LA8690**
Credit: 3.5	L **3**	T **1**	P **0**
Year: **4th**			Semester: **VIII**

UNIT – I **8L**

Introduction to control system, types of control system, applications of control system, transfer function, block diagram analysis, signal flow graphs, introduction to differential equations, mathematical models of physical systems.

UNIT – II **8L**

Introduction to Laplace transform, Laplace transform theorems, inverse Laplace transforms and theorems, application of the Laplace Transform to the Solution of Linear Ordinary Differential Equations.

UNIT – III **6L**

Feedback characteristics of control systems, control systems and components; Time response analysis: Time Response of linear control systems, the Unit-Step Response and Time-Domain Specification, Steady-State Error, Time Response of a First-Order System, Transient Response of a Second-Order System.

UNIT – IV **6L**

Concepts of stability and algebraic criteria; Routh's stability criteria, Root locus technique; basic Properties of Root Loci, properties of the Root Loci, Frequency response analysis, Bode plot and Nyquist stability criteria and Nyquist plot.

UNIT – V **8L**

Stability in frequency domain; phase lag, phase lead, Introduction to controller design, PI, PD and PID controller. Introduction to state variable analysis.

Reference books:

1. Ogata, K.,"Modern Control Engineering", Prentice Hall, 5th edition, 2010.
2. Kuo, B., "Automatic Control Systems", John Willey and Sons, 8th edition, 2009.
3. Nagrath, I.J. and Gopal, M., 2006, Control system engineering, New Age International Publishers.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Mechatronics**	Course Code: **LA8600**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VIII**

UNIT – I **8L**

Mechatronics-A leading edge technology, Systems, measurement system, control system, microprocessor based controller, Response of systems, automation and Mechatronics application.

Signal conditioning- Wheatstone bridge, digital signal –Analog to digital convertor, digital to analog convertor, data acquisition

UNIT – II **8L**

Sensors and transducers – performance terminology, displacement, position and proximity, velocity and motion, force, fluid pressure, temperature, light sensors, selection of sensors.

Actuation system- Mechanical actuations, Pneumatics and Hydraulic actuations system, Electrical actuations systems.

UNIT – III **8L**

Microprocessor and microcontrollers- Concept, Microprocessor system, Architecture and instruction sets for 8085, 8051. Difference between Microprocessor and Microcontrollers.

Digital logic – number system, logic gates, Boolean algebra, karnaugh maps, flip flops, decoders, demultiplexers and multiplexers.

UNIT – IV **8L**

Programmable logic controllers (PLC)- introduction, basic structure of PLC, input and out modules, programming, ladder diagram for Timers, Internal relay and Counters, Shift registers , Master and Jumps controls, selection of PLC, ladder diagram for sequencing of two and three cylinders.

UNIT – V **8L**

Micro-electro mechanical system (MEMS)- introduction, Basic block diagram, material used in MEMS, Manufacturing methods for MEMS like Bulk micromachining, Surface-micro machining and Photolithographic, Application, Advantage.

Industrial Robots- Anatomy of Robots, Robot control system, Robot accuracy and repeatability, law of Robots, End effectors, industrial application, Robots in material handling.

Reference books:

1. Bolten, W.,"Mechatronics electronic control in mechanical and electrical engineering"; pearson education Ltd ISBN 978-81-7758-284-0.
2. Webb. J. W, R. A. Reis, "Programmable Logic Controller – Principles and Applications" 5/e, Prentice Hall of India Ltd. ISBN 81-203-2308-4.
3. Groover M. P.,"Industrial Robotics – Technology, Programming and Applications", McGraw Hill International Editions, Industrial Engineering Series, ISBN 0-0-100442-4.
4. Singh, M.D., & Joshi, J.C., " Mechatronics " PHI publication ISBN 81-203-2986-4

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Computational Methods For Heat Transfer & Fluid Flow**	Course Code: **LA8620**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VIII**

UNIT – I **8L**

Review of basic fluid mechanics and the governing (Navier-Stokes) equations. Types of partial differential equations- hyperbolic, parabolic and elliptic. Traditional solution methods- method of characteristics, separation of variables, Greens function method.

UNIT – II **10L**

Preliminary computational techniques: Discretisation, converting derivatives to discrete algebric expressions, spatial derivatives, time derivatives. Approximation of derivatives, Taylor series expansion, general techniques. Accuracy of discretisation process-higher order vs lower order formulae.

UNIT – III **8L**

Finite difference method: conceptual implementation, application to transient heat conduction problem. Convergence, consistency and stability of FD equation.

UNIT – IV **8L**

Weighted residual methods: General formulation, Introduction to Finite Volume method, Equations with first derivatives and second derivatives. FV method applied to Laplace's equation.

UNIT – V **8L**

Finite Element method: Linear interpolation, quadratic interpolation, two dimensional interpolations. Application to heat transfer problems.

Reference Books:

1. Ferziger, J.H. and Peric, M., "Computational Method for Fluid Dynamics", Springer-VerlagBerlinHeidelberg, 2002.
2. Anderson, J.D., "Computational Fluid Dynamics", McGraw-Hill Publication, 1995.
3. Murlidhar, K. and Sundararajan, T., "Computational Fluid Flow and Heat Transfer", Narosa Publications, 2nd Edition, Reprint 2014.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Machine Tool Design**	Course Code: **LA8640**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VIII**

UNIT – I **8L**

Introduction and General Principles of Machine Tool Design

Developments in machine tools, Types of machine tools, Constructional and Operational Features of basic machine tools e.g. Lathe, Drill, Milling, Shapers and Planers, Grinding machine etc., General requirement of machine tool design, Machine tool design process, Tool wear, Force Analysis

UNIT – II **7L**

Machine Tools Drives

Classification of machine tool drives, Group vs Individual drives, Selection of electric motor, A brief review of the elements of mechanical transmission e.g. gear, belt and chain drives, slider-crank mechanism, cam mechanism, nut & screw transmission, Devices for intermittent motion, Reversing & Differential mechanisms, Couplings and clutches, Elements of hydraulic transmission system. e.g. pumps, cylinder, directional control valves, pressure valves etc., Fundamentals of kinematic structure of machine tools.

UNIT – III **7L**

Regulation of Speed and Feedrates

Laws of stepped regulation, Selection of range ratio, Standard progression ratio, Selection of best possible structural diagram, Speed chart, Design of feed box, Developing gearing diagrams, Step-less regulation of speed and feed in machine tool, Speed and feed control.

UNIT – IV **8L**

Design of Machine Tool Structure

Function of machine tool structures and their requirements, Design criteria for machine tool structures, Selection of material, Basic design procedure for machine tool structures, Design of bed, column and housing, Model technique in design, Design of guide ways and power screws: basic guide way profiles, Designing guide way for stiffness and wear resistance, Hydrostatic and antifriction grand ways, Design of sliding friction power screws, Design of spindle & spindle supports, Layout of bearings, selection of bearings for machine tools.

UNIT – V **8L**

Dynamics of machine tools

General procedure for assessing the dynamic stability of cutting process, Closed loop system, Chatter in machine tools. Control Systems: Functions, requirements & types of machine tool controls, Controls for speed & feed change, Automatic and manual Controls, Basics of numerical controls, Machine tool testing: Geometrical tests on Lathe, Milling and Drilling machines, their performance & significance;

Reference books:

1. N.K. Mehta, "Machine Tool Design and Numerical Control" 3rd Edition, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2012
2. S.K. Basu and D.K. Pal, "Design of Machine Tools", 5th Edition, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 2009
3. G.C. Sen and A. Bhattacharya, "Principles of Machine Tools", Second Edition, New Central Book Agency (P) Ltd., Kolkata, 2009

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Mechanical Vibrations**	Course Code: **LA8670**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VIII**

UNIT – I **10L**

INTRODUCTION:

Periodic motion, harmonic motion, superposition of simple harmonic motions, beats, Fourier analysis. Single Degree Freedom System: Free vibration, Natural frequency, Newton's method, Rayleigh method and Energy method fordetermining natural frequency, Response to an initial disturbance, Torsional vibrations, Damped vibrations. Damping models – Structural, Coulomb and Viscous damping, Vibrations of system with viscous damping, Logarithmic decrement, Viscous dampers

UNIT – II **10L**

Single Degree Freedom: Forced vibration, Sources of excitation, Harmonic Excitation with viscous damping, Steady state vibrations, Forced vibrations with rotating and reciprocating unbalance, Support excitation, Vibration Isolation and Transmissibility, Vibration measuring instruments- Displacement, Velocity, Acceleration and Frequency measuring instrument

UNIT – III **6L**

Two Degree of Freedom System: Introduction, Principal modes, Double pendulum, Torsional system with damping, Coupled System, Vibration absorbers, Centrifugal pendulum absorber, Dry friction damper, Untuned viscous damper

UNIT – IV **7L**

Multidegree of Freedom Systems: Exact Analysis, Undamped free and forced vibrations of multi degree system, Influence coefficients, Reciprocal Theorem, Torsional vibration of multi-rotor system, Principal coordinates, Numerical Analysis - Rayleigh's Mehod, Dunkerley's formula, Holzer's Method, Stodola's Methods and Rayleigh – Ritz method.

UNIT – V **7L**

Critical Speed of Shafts: Shafts with one disc with and without damping, Multi-disc shafts, Secondary Critical speed.

Continuous systems- Longitudinal vibration of bars, Torsional vibrations of Circular Shafts, Lateral vibration of beams.

Reference Books :

1. S.S. Rao, Mechanical Vibrations, 4th edition, Pearson,2014
2. Magreb, Cengage, Mechanical Vibration, India, New Delhi
3. Dr. Debabrata Nag,Mechanical Vibrations, 1st edition,2011
4. V. P. Singh, Mechanical Vibrations, 3rdedition, Dhanpat Rai & Co.,2011.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Advanced Engineering Materials**	Course Code: **LA8650**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VIII**

UNIT – I **8L**

Equilibrium and kinetics: stability and metastability, basic thermodynamic function, statistical nature of entropy and kinetics of thermally activated process.
Introduction to crystal structure and crystal imperfections
Radius ratio rule. Diamond cubic structure and structure of graphite

UNIT – II **8L**

Diffussion In Solid: Fick's law of diffusion, Solution to ficks law of diffusion, application of fick's law, Kirkendall effect , atomic model of diffusion in solid, vacancy and interstitial model of diffusion and the mathematical modeling
Phase transformation: Gibs phase rule, Liver rule , some typical phase diagram. Nucleation and growth, Nucleation and growth kinetics , growth and over all transformation kinetics, transformation in steel and effect of alloying in steel and in cast iron. Precipitation process, solidification and crystallization, Glass transition , recovery recrytallization and grain growth. Strengthening mechanism, Hall pitch relation.

UNIT – III **8L**

Plastic deformation: Mechanism of plastic deformation, shear strength of perfect and real crystal, stress required to move a dislocation. Effect of temperature in dislocation motion, multiplication of dislocation during deformation, effect of solute atom and grain size on dislocation motion.
Fracture: Ductile and brittle fracture**,** Fracture toughness, ductile brittle transition , fracture mechanism map , method of protection against fracture.

UNIT – IV **8L**

Composites Polymer – polymer, metal-metal, ceramic –ceramic, ceramic-polymer, metal-ceramic, metal polymer composites. Dispersion reinforced, particle reinforced, laminated and fibre reinforced composites. Mechanical behaviour of polymer, ceramic and composite.

UNIT – V **8L**

Elasiomers and Masullaneous types, properties and identifications of different types of rubbers vulcanization, fabrication and forming techniques of rubber. Introduction of plastics and ceramics – types, application and process. Smart materials-introduction and types. Selection of materials and factors effecting deflection, Selection process and systematic evaluation.

Reference books:

1. Raghvan, V., "Materials Science And Engineering " , PHI Learning Private Limited, 2013.
2. Van Vlack,L. H." Elements of Materials Science and Engineering, Pearson Education India,
3. Callister W. D. &Rethwisch, D. G. , "Materials Science and Engineering: An Introduction" John Wiley & Sons,2006
4. Mittermeijer, Eric J. "Fundamentals of Materials Science: The Microstructure–Property Relationship Using Metals as Model Systems", Springer verlag BerlinHeidelberg, 2010.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Product Design And Development**	Course Code: **LA8660**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VIII**

UNIT – I **8L**

Significance of product design, Need for developing products, product design and development process, the importance of engineering design, sequential engineering design method, relevance of product lifecycle issues in design, the challenges of product development

Product Planning and Project Selection

generic product development process, Identifying opportunities, evaluate and prioritize projects, allocation of resources, various phases of product development-planning for products

UNIT – II **8L**

Identifying Customer Needs

Voice of customer, customer populations, Interpret raw data in terms of customers need, hierarchy of human needs, need gathering methods, establish the relative importance of needs

Product Specifications: Establish target specifications, setting final specifications

Concept Generation: Activities of concept generation, clarifying problem, search both internally and externally, explore the output

UNIT – III **6L**

Industrial Design: Assessing need for industrial design, industrial design process, management, assessing quality of industrial design, human factors design, user friendly design

Concept Selection: Overview, concept screening and concept scoring, methods of selection, case studies

UNIT – IV **6L**

Theory of inventive problem solving (TRIZ): Fundamentals, methods and techniques, General Theory of Innovation and TRIZ, Value engineering Applications in Product development and design, Model-based technology for generating innovative ideas

Concept Testing: Elements of testing: qualitative and quantitative methods including survey, measurement of customers' response

UNIT – V **8L**

Intellectual Property: Elements and outline, patenting procedures, claim procedure

Design for Environment: Impact, regulations from government, ISO system, case studies

Reference books:

1) Anita Goyal, Karl T Ulrich, Steven D Eppinger, "Product Design and Development ",Tata McGraw-Hill Education,4th Edition, 2009,
2) Kevin Otto, Kristin Wood, "Product Design", , Pearson Education, Indian Reprint 2004
3) Yousef Haik, T. M. M. Shahin, "Engineering Design Process Cengage Learning", 2010, 2nd Edition Reprint,
4) Kevin Otto, Kristin Wood, "Product Design", Pearson Education Indian Reprint 2004,
5) Clive L.Dym, Patrick Little, "Engineering Design: A Project-based Introduction", John Wiley & Sons, 3rd Edition 2009.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME)
Batch: 2016-20

Course Title: **Finite Element Methods**	Course Code: **LA8680**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VIII**

UNIT – I **8L**

Introduction to Finite Difference Method and Finite Element Method, Advantages and disadvantages.

UNIT – II **8L**

Mathematical formulation of FEM, Variation and Weighted residual approaches, Shape functions, Natural co-ordinate system, Element and global stiffness matrix, Boundary conditions, Errors, Convergence and patch test, Higher order elements.

UNIT – III **6L**

Application to plane stress and plane strain problems, Axi-symmetric and 3D bodies, Plate bending problems with isotropic and anisotropic materials, Structural stability, Other applications e.g., Heat conduction and fluid flow problems.

UNIT – IV **6L**

Idealization of stiffness of beam elements in beam-slab problems, Applications of the method tomaterially non-linear problems, Organization of the Finite Element programmes, Data preparation andMesh generation through computer graphics, Numerical techniques, 3D problems.

UNIT – V **8L**

FEM, an essential component of CAD, Use of commercial FEM packages, Finite element solution of existing complete designs, Comparison with conventional analysis.

Reference Books:

1. Zienkiewicz, O. C., "The Finite Element Method, 3rd ed, McGraw-Hill, New York", 1977.
2. Reddy, J. N., "An Introduction to the Finite Element Method", Third Edition, McGraw—Hill, New York, 2006
3. Bathe, K. J., "Finite Element Procedures in Engineering Analysis", Prentice-Hall, 1982.
4. Krishnamoorthy, C.S., "Finite Element Analysis: Theory and Practice", McGraw Hill Inc., 1994.

DIT UNIVERSITY

Dehradun

Course Structure & Detailed Syllabus

of

B. Tech. in Mechanical Engineering

Automobile Engineering

Batch 2016-20

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Year: 1st **Semester: I**

Course Code	Course Title	L	T	P	Credit
JA1010	Engineering Mathematics-I	3	1	0	3.5
BA1210	Engineering Chemistry	3	1	2	4.5
EA1210	Introduction to Electrical Engineering	3	1	2	4.5
FA1210	Introduction to Electronics & Communication	3	1	2	4.5
HA1210	Professional Communication-I	3	1	0	3.5
DA1210	Computer Fundamental & C Programming	3	0	2	4
LA1110	Workshop Practice	0	0	2	1
	Total				**25.5**

Year: 1st **Semester: II**

Course Code	Course Title	L	T	P	Credit
JA2010	Engineering Mathematics-II	3	1	0	3.5
OA1210	Engineering Physics	3	1	2	4.5
LA1210	Essentials of Mechanical Engineering	3	1	2	4.5
HA2210	Professional Communication-II	3	0	1	3.5
DA2210	Computer Programming in C++	3	0	2	4
BA1010	Environmental Science	2	0	0	2
LA1220	Engineering Graphics	1	0	0	1
HA1310	Soft Skills Development	0	0	2	1
	Total				**24**

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Year: 2nd **Semester: III**

Course Code	Course Title	L	T	P	Credit
LA3210	Material Science	3	1	2	4.5
LA3010	Engineering Thermodynamics	3	1	0	3.5
LA3020	Strength of Materials	3	1	0	3.5
LA3030	Manufacturing Processes I	3	0	0	3
LD3210	Theory of Machine	3	1	2	4.5
EA32L0	Electrical Machines	3	1	2	4.5
LA3110	Machine Drawing	0	0	2	1
	Total				**24.5**

Year: 2nd **Semester: IV**

Course Code	Course Title	L	T	P	Credit
JA3010	Engineering Mathematics III	3	1	0	3.5
LA4210	Manufacturing Processes II	3	0	2	4
LD4210	Basic Automobile Engineering	3	1	2	4.5
LD4220	Fluid Mechanics & Machinery	3	1	2	4.5
LD4230	Automotive fuel & lubricants	3	0	2	4
LA4020	Machine Design–I	3	1	0	3.5
LA4410	Industrial Tour	0	0	2	1
LA4Z11	Value Addition Training	0	0	2	1
	Total				**26**

List of Courses for Value Addition Training

Pro-E, ANSYS, CATIA , Solid Works etc.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Year: 3rd **Semester: V**

Course Code	Course Title	L	T	P	Credit
LD6010	Automotive Transmission	3	1	0	3.5
LD5220	Heat Transfer	3	1	2	4.5
LA5230	Mechanical Measurements	3	1	2	4.5
LA5010	Industrial Engineering. Management	3	0	0	3.0
LA5020	Machine design II	3	1	0	3.5
LA5310	Aptitude Building I	0	0	2	1
LD6110	Styling Studio & Design Lab/ Stress Analysis (ANSYS)	0	0	2	1
	Total				**21**

Year: 3rd **Semester: VI**

Course Code	Course Title	L	T	P	Credit
LA6210	Internal Combustion Engine	3	1	2	4.5
LD6210	Vehicle Maintenance	3	0	3	4.5
LD5210	Advance Automobile Engineering	3	1	2	4.5
LD6020	Alternate Fuel & Energy	3	0	0	3
LD6120	Automotive Design using CAD Software	0	0	3	1.5
LA6110	Project Phase I	0	0	4	2
LA6310	Aptitude Building II	0	0	2	1
	Total				**21**

After VI semester student will undergo minimum 6 weeks Industrial Training which will be evaluated in the VII semester.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Year: 4th **Semester: VII**

Course Code	Course Title	L	T	P	Credit
LA7210	Computer Integrated Manufacturing	3	0	2	4
LA7010	Total Quality Management	3	0	0	3
LD7010	Special Vehicles & Equipment	3	1	2	4.5
LD7210	Auto Pollution & Control	3	0	0	3
UG I	Departmental Elective –I	3	0	0	3
LA7110	Project Phase II	0	0	4	2
LA7510	Industrial Training and Presentation*	0	0	8	4
	Total				**23.5**

* During Summer Vacation after VI semester students are compulsorily required to attend Industrial Training of 6-8 weeks which will be evaluated in VII Semester under Industrial Training Presentation (LA7510).

Course Code	Course Title	Credit
LD7610	Emerging Automotive Technologies	3
LD7620	Advances in I.C. Engines	3

Year: 4th **Semester: VIII**

Course Code	Course Title	L	T	P	Credit
OE	Open Elective	3	0	0	3
UG II	UG Elective –II	3	1	0	3.5
UG III	UG Elective –III	3	1	0	3.5
UG IV	UG Elective –IV	3	1	0	3.5
LA8110	Project Phase–III	0	0	8	4
	Total				**17.5**

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20
List of UG Electives

Elective	Course Code	Course Title
UG Elective II	LD8610	Quality Control and Reliability Engineering
	LD8620	Vehicle Body Engineering
	LD8630	Paint & Paint Shop Technology
	LD8640	Vibration, Noise and Harness Control
UG Elective III	LD8650	Supply Chain Management
	LD8660	Vehicle & Transport Management
	LD8670	Professional Ethics in Engineering
UG Elective IV	LA8600	Mechatronics
	LA8670	Mechanical Vibrations
	LD8690	Motor Vehicle & Environment Protection Laws

List of Open Electives (To be conducted in VIII Semester)

Sl. No.	Branch	Subject Code	Name of Elective subjects
1	Physics	OA8710 OA8720	1. Nano Scale Science and Technology 2. Photonics Technology
2	EE	EA8710 EA8720	1. Non-Conventional Energy Resources 2. Instrumentation and Process control
3	ME	LA8710 LA8720	1. Entrepreneurship development 2. Quality Management
4	Civil	CA8710 CA8720	1. Environment and Ecology 2. GIS
5	CSE	**DA8740** DA8710	1. Management Information System (MIS) 2. Business Intelligence
6	IT	IA8730 IA8721	1. Internet of Things 2. IT In Business
7	ECE	FA8710	1. Consumer Electronics
8	Humanities	HA8710 HA8720	1. Industrial Psychology 2. Human Values and Ethics
9	MBA	GA8710 GA8730 GA8740	1. Organizational Behavior 2. Digital Marketing 3. Financial Modeling with Spread sheet

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Engineering Mathematics-I**			Course Code: **JA1010**
Credit: **3.5**	L **3**	T **1**	P **0**
Year: **1st**			Semester: **I**

UNIT I: Differential Calculus-I [**9**]

Functions of single variable: Limit continuity and differentiability; Indeterminate forms; Mean value theorems; Role's Theorem; Taylor's theorem with remainders; Curve tracing.

UNIT II: Differential Calculus-II [**9**]

Successive differentiation; Leibnitz theorem; Partial differentiation; Euler's theorem; Expansion of functions of several variables; Extrema of functions of several variables; Lagrange's method of multipliers.

UNIT III: Integral Calculus [**9**]

Improper integral-Beta and Gamma functions; Double and Triple integrals; change of order of integration; change of variables; Dirichlet's integral and its applications; Application of multiple integral.

UNIT IV: Vector Calculus [**12**]

Vector Differentiation: Scalar and vector fields; gradient of scalar point function; directional derivatives; divergence and curl of vector point function; solenoidal and irrotational vectors.

Vector Integration: line, surface and volume integrals; Green's theorem; Stokes' theorem and Gauss divergence theorem (without proof).

Text Books:

- R. K. Jain & S. R. K. Iyenger, **Advanced Engineering Mathematics**, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.

Reference Books:

- E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, John &Wiley Sons, U.K., 2006.
- B. S. Grewal, **Higher Engineering Mathematics**, 42th Edition, Khanna publication, New Delhi, India, 2012.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Engineering Chemistry**	Course Code: **BA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **I**

UNIT – I

Water Chemistry

Introduction, Analysis of Water – Alkalinity, Chlorides and Dissolved Oxygen, Hardness of Water - Temporary and Permanent hardness, Estimation of hardness by EDTA Method, Disadvantages of Hard Water, Numerical problems.

Water for Industrial purpose – Boiler Feed Water, Boiler Troubles (Priming and Foaming, Boiler Corrosion, Scales and Sludges, Caustic Embrittlement), Water Treatment: Internal Treatment (Colloidal, Phosphate, Calgon, Carbonate Conditioning), External Treatment (Lime-Soda Process, Zeolite Process, Ion- Exchange Process), Numerical Problems.

UNIT – II

Physical Chemistry

Electrochemistry: Reference electrodes, Ion selective electrodes, Chemically modified electrodes as sensors, Electrochemical energy systems, Lithium batteries, Fuel cells.

Thermochemistry: Hess's Law, Heat of a reaction, Effect of temperature on heat of reaction at constant pressure (Kirchoff's eq.), Heat of dilution, Heat of hydration, Heat of neutralization and Heat of combustion.

Surface chemistry: Surface and interfacial tension, Capillary pressure. Adsorption phenomenon, Adsorption of gaseson solids, Frendlich and Langmuir adsorption isotherms, Role of adsorbents in catalysis, ion-exchange and pollution abatement.

UNIT – III

Science of Corrosion and Protective Coatings

Introduction, Types of Corrosion, Theories of Corrosion and Mechanism, Factors Influencing Corrosion. Control of Corrosion.

Types of Protective Coatings: Metallic Coatings, Anodic Coatings, Galvanization, Cathodic Coatings, Tinning, Metal Cladding, Electroplating (Chromium Plating, Metal Spraying, Cementation-Sheradizing, Colourizing, Chromizing).

UNIT – IV

Introduction to Polymers and Nano-materials

Polymerization, Classification of polymers, Addition and Condensation Polymerizations. Plastics - Thermosetting and Thermoplastics. Preparation, Properties and Uses of Polyethylene, PVC, Teflon, Bakelite, Nylon, Polyester, Polyurethane, Ziegler-Natta catalyst, conducting polymers. Rubber- Processing of Natural Rubber, Vulcanization and Compounding. Elastomers: Buna-S, Buna- N, Thiokol.

Introduction to Nano-materials: Fullerenes, Nano-tubes, Nano-wires, Nano-cones, Nano-dots, Nano-sphere, Haeckelites. Their electronic and mechanical properties, Production methods for CNTs. Applications of nano materials in i) Medicine ii) Catalysis iii) Environmental Technologies iv) Electronics & related fields. v) Mechanics.

UNIT – V

Fuels & Lubricants

Fuels: Classification, crude oil: composition and fractionation, Octane & Cetane Number and their significance; calorific value of fuel, Determination of calorific value of fuels, bomb calorimeter, Solid fuels - Proximate and ultimate analysis, Numerical problems.

Lubricants: Functions of lubricants, Mechanism of Lubrication (thick film or hydrodynamic lubrication, thin film or boundary lubrication, extreme pressure lubrication), Classification and properties of lubricants- Viscosity, Flash and fire point, Cloud and pour point, Aniline point, Neutralization number and mechanical strength. Numerical problems on acid value and saponification value.

Text Books:

1. Chemistry in Engineering & Technology (Vol I & II) (Latest ed.) By J.C. Kuriacose& J. Rajaraman, Tata McGraw-Hill Co, New Delhi.
2. Engineering Chemistry by O.G. Palanna, Tata McGraw-Hill Co, New Delhi.

Reference Books:

1. Atkins' Physical Chemistry by Peter W. Atkins and Julio de Paula, Oxford University Press.
2. Principles of Physical Chemistry (Latest ed.) By Puri, Sharma & Pathania.
3. Organic chemistry, Morrison and Boyd, Pearson Prentice Hall, 2011
4. Environmental chemistry, S.E. Manahan, 9th edition, CRC Press.
5. Textbook of polymer science by F.W. Billmeyer, Wiley India.

Engineering Chemistry Lab

List of Experiments

1. Estimation of hardness of water by EDTA method
2. Estimation of total alkalinity in the given water sample.
3. Estimation of dissolved oxygen in the given water sample.
4. Estimation of available chlorine in the given sample of bleaching powder.
5. pH-metric titration.
6. Determination of viscosity of lubricants by Redwood viscometer / Ostwald's viscometer.
7. Determination Surface Tension of lubricants.
8. Determination of Flash point of a given oil by Pensky_Marten's flash point approach.
9. To Determine Saponification-value of the given Lubricating Oil.
10. To Determine Acid-Value of the given Lubricating Oil.
11. To determine the moisture, volatile and ash contents in a given coal sample by proximate analysis.
12. To study the adsorption of acetic acid on activated charcoal.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Introduction to Electrical Engineering**	Course Code: **EA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **I**

UNIT – 1
D.C. NETWORK THEORY
Review of basic circuit theory concepts, Mesh and Nodal analysis, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Star–delta transformation, Magnetic Circuits.

UNIT – 2
A.C. CIRCUITS & MEASURING INSTRUMENTS
*Single Phase A.C.:*Phasor representation of voltage and current, A.C. circuit behavior of resistance, inductance, capacitance & their combination in series and parallel, Power triangle, Power factor, Concept of series & parallel resonance.
*Three Phase A.C.:*Star – delta connections, Relation between line and phase quantities, three phase power and its measurement, What is 3 phase 4 wire and 3 phase 5 wire system?
Measuring Instruments: Construction and principle of voltage and current measuring instruments.

UNIT – 3
TRANSFORMERS
Principle of operation, Types of construction, Phasor diagram, Equivalent circuit, Efficiency and voltage regulation of single phase transformer, O.C. and S.C. tests.

UNIT – 4
D.C. & SYNCHRONOUS MACHINES
D.C. Machines: Construction and working principle of d.c. generator and d.c. motor, Types of d.c. machines, E.M.F. equation, Torque equation, Magnetization and load characteristics, Losses and efficiency, Need of starter in d.c. motors.
Synchronous Machines: Construction and Principle of operation of Alternator and Synchronous Motor.

UNIT – 5
INDUCTION MOTORS
Three Phase Induction Motors: Principle of operation of 3-Ø induction motor, Types of 3-Ø induction motor, Need of starters in 3-Ø induction motors, Slip – torque characteristics,
Single Phase Induction Motor: Principle of operation of single phase induction motor, Methods of starting of single phase induction motor.

Reference Books:
1. V. Del Toro. " Principles of electrical Engineering, "Prentice hall International.
2. W.H. Hayt& J.E. Kemmerly," Engineering circuit Analysis, "McGraw Hill.
3. I. J. Nagrath, "Basic Electrical Engineering," Tata Mc. Graw Hill.
4. A. E. Fitgerald, D.E., Higginbotham and A Grabel, "Basic Electrical Engineering" McGraw Hill
5. H. Cotton, "Advanced Electrical Technology" Wheeler Publishing.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20
Basic Electrical Engineering Lab

(Any Ten)

1. Verification of Network Theorems.
2. Study of diode characteristics. Study of phenomenon of resonance in RLC series circuit.
3. Measurement of power in a three phase circuit by two wattmeter method.
4. Measurement of efficiency of a single phase transformer by load test.
5. Determination of parameters and losses in a single phase transformer by OC and SC test.
6. Study of characteristic of DC Motor.
7. Study of characteristic of AC Motor.
8. DC generator characteristics.
9. 10. Speed control of dc shunt motor.
10. Study running and reversing of a three phase induction motor.
11. Study of a single phase energy meter.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Introduction to Electronics & Communication**	Course Code: **FA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **I**

UNIT 1: Fundamental of Semiconductors ***10 L***

Energy bands in semiconductors, intrinsic and extrinsic semiconductors, Fermi Level in Intrinsic and Extrinsic semiconductor, Carrier transport in semiconductors: diffusion current, drift current, mobility, Hall Effect and resistivity. Generation and recombination of carriers.

UNIT 2: Application of Low Power and High Power Diodes ***10 L***

Diode circuits: Construction, Junction diode characteristics, Half and full wave rectifiers - Expression for efficiency and ripple factor - Bridge rectifier – π Filter circuits, Clipper, Clamper and multipliers using diodes, Zener Diode Characteristics - Regulated power supply using Zener diode.

UNIT 3: Transistor fundamentals ***8 L***

Transistor circuits: Characteristics of a transistor in CB, CE and CC modes - Relatively merits - Biasing of Transistors - Load Line and operating point concept (both AC and DC). Construction and working of JFET and MOSFET.

UNIT 4: Digital fundamentals and Introduction to Signals ***8 L***

Basic logic gates: AND, OR, and NOT – implementation of all gates using Universal gates, Number Systems conversions, Boolean algebra, K-map (upto 4 variables). Source of Information, Types of Signals.

UNIT 5: Basics of Communications & Instrumentation ***9 L***

*C*ommunication Systems, Communication Channels, Need of modulation, Types of modulations (Wave shapes and final expression only), Study of Piezoelectric, PMMC, LVDT and Strain Gauge transducers and their classifications and display device (7 segment) only.

Reference Books:

Unit 1. Electronics Devices and Circuits, Millman and Halkias, Tata McGraw Hill, 4th ed.
Unit 2 & 3. Electronic Devices and Circuit Theory, Robert L. Boylestad, Prentice Hall Higher Edu., 2000.
Unit 4. Digital Design, Morris Mano, PHI
Unit 4. Modern Digital & Analog Communications, B. P. Lathi, OUP
Unit 5. Electronic Communication Systems, John Kennedy , Tata McGraw Hill, 4th ed.
Unit 5. Electronic Instrumentation - H. S. Kalsi

ELECTRONICS ENGINEERING LAB.

1. To identify and Study of the various component and Devices of electronics with their specification (CRO, Function Generator, Multimeter, Power Supply, resistor, capacitor, inductor, ICs, LED, potentiometer etc.)
2. To study the V-I characteristics of PN diode and Zener diode.
3. To find the efficiency of Rectifiers and ripple factor of capacitive and non-capacitive half wave and full wave rectifier.
4. To Study and Verify clipper and clamper with biased circuits.
5. To find the characteristics of CB and CE amplifiers.
6. Determine the characteristics of FET.
7. To find out the power energy of various periodic and non periodic signals.
8. To verify the logic gates using diodes.
9. Study and observations of AM & FM Waveforms.
10. Study of various transducers (Strain Gauge).

***** *Plus 2-3 value added experiments can be performed.*

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Professional Communication – I**			Course Code: **HA1210**
Credit: **3.5**	L **3**	T **1**	P **0**
Year: **1st**			Semester: **I**

UNIT 1: **COMMUNICATION** **(6 Hrs)**

1. Communication: Definition and Process of Communication.
2. Types of Communication: Formal and Informal Communication, Verbal and Non-Verbal Communication.
3. Barriers to Communication: Intrapersonal and Interpersonal Barriers. Semantic Barriers, Physical Barriers, Psychological Barriers, and Organizational Barriers.

UNIT 2: **LISTENING SKILLS & SPEAKING SKILLS** **(8 Hrs)**

1. Importance and Objective of Listening Skills, Process of Listening, Listening and Hearing, Types of Listening, and Methods for Improving Listening Skills
2. Listening Comprehension: Identifying General and Specific Information.
3. Listening for Note taking and drawing Inferences.
4. Importance of Speaking Skills, Types of Speaking, Methods for Improving Speaking Skills
5. Introduction to Phonetic Transcription: Familiarization with British and American Usage.

UNIT 3: **READING SKILLS** **(4 Hrs)**

1. Importance of Reading Skills, Types of Reading Skills, Methods of Improving Reading Skills.
2. Vocabulary Building: Antonyms, Synonyms, Homophones, Homonyms, and One-Word Substitution, Etymology and roots.

UNIT 4: **WRITING SKILLS** **(10 Hrs)**

1. Importance of Writing Skills, Types of Writing Skills, and Methods for Improving Writing Skills.
2. Sentence and Paragraph Construction. Writing Expository, Argumentative and Deductive Order etc Paragraphs.
3. Précis Writing
4. Basic Letter Writing: Format and Style of Formal Letters.

UNIT 5: **ONE ACT PLAY** **(6 Hrs)**

Practice of LRSW through the study of the one act play, ***THE REFUND*** by **Fritz Karinthy**.

TEXT BOOK

1. Gupta, Ruby. Basic Technical Communication, Cambridge University Press, New Delhi.2012.

REFERENCE BOOKS

1. Rizvi, Ashraf. Effective Technical Communication, McGraw Hill, New Delhi. 2005
2. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011
3. Tyagi, Kavita& Padma Misra. Basic Technical Communication, PHI, New Delhi. 2011
4. Lewis, Norman. Word Power Made Easy, W.R Goyal Pub. & Distributors.1995
5. Ford A, Ruther. Basic Communication Skills; Pearson Education, New Delhi.2013
6. Aslam, Mohammad. Introduction of English Phonetics and Phonology Cambridge.2003
7. Kameswari, Y. Successful Career Soft Skills and Business English, BS Publications, Hyderabad.2010
8. English Pronouncing Dictionary, Cambridge.2012
9. The Oxford Guide to Writing and Speaking. OUP, Delhi.2011

Professional Communication – I Lab

Lab 1	Neutralization of Mother Tongue Influence through manner of articulation
Lab 2	Common Errors in English and Indianisms.
Lab 3	Introduction to Speech Sounds – Practicing Vowel and Consonant sounds
Lab 4	Syllable, word stress, Sentence stress
Lab 5	Pause group, Intonation & Rhythm
Lab 6	Functional English
Lab 7 & 8	Everyday Conversation : Greetings, Apologies, Requests, At a Restaurant, Shopping, Groceries, Hiring an Apartment, Travel Courses, etc.
Lab 9	Developing Listening skills through cultural movies
Lab 10 &11	Movie - To provide exposure to the target language
Lab 12	Final evaluation based on Extempore

References: (Software and Videos)

1. Wordsworth English Language laboratory software
2. Wordsworth Prep 1-2-3
3. Connected Speech Level 1-2-3
4. Learn To speak English CD 1-2-3-

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Computer Fundamentals and 'C' Programming**			Course Code: **DA1210**
Credit: **4**	L **3**	T **0**	P **2**
Year: **1st**			Semester: **I**

UNIT 1 **(8 L)**

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system: Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

UNIT 2 **(8 L)**

Standard I/O in C, Fundamental data types- Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external**,** Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Fundamentals of C programming: Structure of C program**,** writing and executing the first C program, components of C language. Standard I/O

UNIT 3 **(8 L)**

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch**,** program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break, continue and goto statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

UNIT 4 **(8 L)**

Arrays: Array notation and representation, manipulating array elements using one and two dimensional arrays, linear searching, sorting (bubble sort), strings, matrix manipulation (transpose, addition, multiplication).

Structures: Purpose and uses of structures, declaring structures, array of structures, union, enumerated data types

UNIT 5 **(8 L)**

Pointers: Pointers: pointer variables, pointer operator, pointer expression, array of pointers, multiple indirection, pointers to functions, dynamic memory allocation functions.

File handling**,** standard C preprocessors**,** defining and calling macros, conditional compilation.

Text Books:

1. YashwantKanetkar, "Let us C", BPB Publications, 2nd Edition, 2001.
2. Herbert Schildt, "C:The complete reference", OsbourneMcgraw Hill, 4th Edition, 2002.
3. Computer Fundamentals and Programming in C. ReemaThareja, Oxford Publication
4. P.K. Sinha "Computer Fundamentals" B.P.B Publication.

Reference Books:

1. Raja Raman, "Computer Programming in C", Prentice Hall of India, 1995.
2. Kernighan & Ritchie, "C Programming Language", The (Ansi C Version), PHI, 2nd Edition.
3. Byron Gottfreid "Schaum's Outline of Programming with C".

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20
List of Programs in 'C' Lab

Lab 1	(a) WAP to perform simple arithmetic operations using different data types. (b) WAP to show swap of two no's without using third variable.
Lab 2	(a) WAP to find the roots of a quadratic equation. (b) WAP to check the number is odd or even and find the sum of all odd and all even separately.
Lab 3	(a) WAP to find out whether the given number is prime or not. Find sum of all prime upto N. (b) WAP to reverse a given number and check the palindrome status.
Lab 4	WAP to print corresponding days of a week using switch case.
Lab 5	WAP to find and generate the Armstrong number.
Lab 6	WAP to print pattern triangle like Floyd's, Pascal, pyramid triangle.
Lab 7	(a) WAP to interchange two values using call by value and call by reference. (b) WAP to print factorial of a number using recursion & without using recursion.
Lab 8	WAP to print Fibonacci series. (**a**) Without using function (**b)** using function (**c)** using recursion
Lab 9	(a) WAP to print an array and find greatest/smallest element of an array. (b) WAP to perform linear searching in an array.
Lab 10	(a) WAP to insert/ delete element from an array. (b) WAP to sort the array's element using Bubble sort.
Lab 11	WAP to perform the following string functions. **a.** Strlen **b**. strcmp **c.**strcpy **d**. strcat **e**. strlwr **f**.strupr
Lab 12	Declare a suitable structure of a college and print the name and DOB of the student have scored more than sixty percent marks in end semester exam.
Lab 13	Declare a suitable structure for an organization and print all the names of employees having salary more than Rs.1000.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Workshop Practice**			Course Code: **LA1110**
Credit: **1**	L **0**	T **0**	P **2**
Year: **1st**			Semester: **I / II**

List of Experiments

1. Carpentry: To make a T-Lap joint with soft wood.
2. Arc Welding: To make a Lap joint with mild steel flat by arc welding process.
3. Gas Welding: To make a Lap joint of M.S. sheet with gas welding process.
4. Fitting: To make a plug and socket joint with M.S. flat.
5. Machine Shop: To turn a M.S. rod on lathe to prepare a turning specimen.
6. Sheet Metal: To make a square tray with G.I. sheet.
7. Study of Foundry and Forging tools and equipments

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Engineering Mathematics – II**	Course Code: **JA2010**
Credit: **3.5**	L **3** T **1** P **0**
Year: **1st**	Semester: **II**

UNIT I: **(10L)**

Linear Algebra

Matrices; Inverse of matrix; Echelon form; Rank of matrix; Consistency and solution of a system of linear equations; Linear dependence and independence of vectors; Matrix transformations; Eigen values and eigenvectors; Cayley– Hamilton theorem; Reduction to diagonal form; Vector spaces; Sub spaces; Basis; Dimension; Linear Transformation**.**

UNIT II: **(8L)**

Differential Equations

Linear differential equations first order and first degree; Linear differential Equations of higher orders with constant coefficients; Complementary functions and Particular integrals; Euler-Cauchy linear differential equations; Simultaneous linear differential equations; Method of variation of parameters.

UNIT III: **(6L)**

Infinite Series

Introduction; Sequences; Series; Convergence; Series of positive terms; Comparison test; Integral test; D'Alembert's Ratio test; Cauchy's root test; Alternating series; Leibnitz rule.

UNIT IV: **(8L)**

Fourier Series

Periodic functions; Fourier series of Periodic functions; Euler's formulae; Functions having arbitrary period; Change of intervals; Even and Odd functions; Half range sine and cosine series.

UNIT V: **(8L)**

Laplace Transform

Laplace Transform; Existence theorem; Properties of Laplace Transform ; Laplace Transform of derivatives and integrals; Laplace Transform of Periodic functions; Unit Step function and Error Function; Dirac- Delta function; Unit impulse function; Convolution theorem; Applications of Laplace Transform to solve linear and simultaneous differential equations.

Text Books:

1. R. K. Jain & S. R. K. Iyenger, **Advanced Engineering Mathematics**, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.
2. E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, John Wiley & Sons, U.K., 2006.

Reference Books:

1. W. E. Boyce and R. Di Prima, **Elementary Differential Equations**, (8th Edition), John Wiley & Sons, U.K., (2005).
2. B. S. Grewal, **Higher Engineering Mathematics**, 42nd Edition, Khanna Publication, New Delhi, India, 2012.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Engineering Physics**	Course Code: **OA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **II**

UNIT I:

Relativistic Mechanics: Inertial and Non-inertial Frames; Postulates of Special Theory of Relativity; Galilean and Lorentz Transformation; Length Contraction and Time Dilation; Addition of Velocities; Variation of Mass with Velocity and Mass Energy Equivalence.

UNIT II:

Interference: Introduction; Coherent Sources; Analytical treatment of interference; Young's double slit experiment and its analysis; Conditions of Interference; Fresnel's Biprism; fringes with white light; Determination of wavelength of monochromatic light by using Fresnel's Biprism method; Displacement of Fringes; Interference in plane parallel thin film (reflected and transmitted light) and wedge shaped film(reflected light only); Newton's Rings; Determination of wavelength of monochromatic light and determination of refractive index of a liquid by using Newton's ring method.

UNIT III:

Diffraction: Introduction; Difference between Interference and diffraction; resultant of superposition of n simple harmonic coherent vibrations; Fraunhofer diffraction due to single slit: resultant intensity; conditions of maxima; minima; angular and linear width of central maximum; Double slit diffraction: resultant intensity; missing order; N-slit diffraction : resultant intensity; conditions of maxima and minima; missing orders; angular width of principal maxima; Diffraction grating: formation of spectra and missing order spectra in spectrum; dispersive power of grating; Resolving power; Rayleigh Criterion of resolution; Resolving power of plane transmission diffraction grating.

UNIT IV:

Polarization: Polarised and unpolarised light and its pictorial representation; plane of polarisation and plane of vibration; Phenomenon of Double Refraction; positive and negative double refracting crystals; properties of ordinary and extra-ordinary Rays; Nicol Prism and its application as a polariser and analyser; Mathematical analysis of superposition of two linearly polarised light vectors; retardation plates – half wave plate and quarter wave plate; Production and detection of Plane; Circularly and Elliptically Polarized Light.

Laser: Spontaneous emission; stimulated emission and stimulated absorption; Einstein's A and B Coefficients and relation between them; Principle of Laser Action; Construction and Working of He-Ne; Semiconductor Laser.

UNIT V:

Wave Mechanics : Wave Particle Duality; de Broglie Concept of Matter Waves; Davisson and Germer experiment; Concept of wave packet; group and phase velocity; Heisenberg Uncertainty Principle and its applications viz. nonexistence of electron in nucleus; radius and energy of Bohr's first orbit; Schrödinger time independent and time dependent wave equation; Physical interpretation of wave function; Application of Schrodinger wave equation: Particle in a one dimensional box (eigen function and eigen values).

Introduction to Fibre Optics: Fundamental ideas about optical fiber; Types of fibers; Acceptance angle and cone; Numerical Aperture.

Text Books:

1. AjoyGhatak**; Optics;** Tata Mc-Graw Hill Education;2009.
2. Subramanyam; BrijLal;**A Text Book of Optics**; S. Chand, 2004.
3. K. Thyagarajan, AjoyGhatak; **Lasers: Fundamentals and Applications**; Second;Springer, 2010.
4. AjoyGhatak& K. Thyagarajan ;**Introduction to Fiber optics;**Cambridge University Press,1998.
5. Halliday, Resnick& Walker; **Principles of Physics**; Nineth, Wiley, India;2013

Reference Books:

1. Arthur Beiser ;**Concepts of Modern Physics**; Tata Mc-Graw Hill Education;2003.
2. Robert Resnick;**Introduction to Special theory of Relativity** ; First; John Wiley& Sons; 1968.
3. Jenkins and White ;**Fundamentals of Optics**; Fourth; McGraw-Hill;2001
4. David. J. Griffith; **An Introduction to Quantum Mechanics**;Second; Pearson prentice Hall; 2004.
5. Young and Freedman;**Sears and Zemansky's University Physics**,Tenth; Addison-Wesley, 2000.

List of Experiments

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help ofFresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locatethe position of cardinal points.
4. To determine the specific rotation of cane sugar solution using bi quartz polarimeter.
5. To determine the wavelength of spectral lines using plane transmissiongrating.
6. To determine the specific resistance of the material of given wire usingCarey Foster's bridge.
7. To determine the variation of magnetic field along the axis of a currentcarrying coil and then to estimate the radius of the coil.
8. To verify Stefan's Law by electrical method.
9. To calibrate the given ammeter using potentiometer.
10. To calibrate the give voltmeter using potentiometer.
11. To determine energy band gap of a given semiconductor material by p-n junction method.
12. To determine the viscosity of water by Poisseuille's method.

Note: Additional experiments may be added based on contents of syllabus.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Essentials of Mechanical Engineering**			Course Code: **LA1210**
Credit: 4.**5**	L **3**	T **1**	P **2**
Year: **1st**			Semester: **II**

UNIT – I **9L**

Introduction to Engineering: Difference between Science and Technology, history of wheel, introduction to prime movers, transmission system, belt, pulleys, gear system and nomenclature, braking system, Mechanism, lever mechanism, Working principle of power generation system, hydel power plant, thermal power plant and its main components.

Coplanar Force system: Resolution of force in two mutually perpendicular direction Free Body Diagram, Moment, Varignon's theorem, static equilibrium, Lami'sTheorem, type of joints/Support, Type of load: point load, uniformly constant and varying loads, beam and its type.

UNIT – 2 **7L**

Engineering material and their properties: Details of hook's law, Proportional limit, Yield point, Yield Stress, Engineering strain, Engineering stress, True stress and Strain, Plasticity, Elasticity, Allowable Strength, Hardness, Ductility, toughness, Fatigue, creep, strain energy, Impact Strength, Young modulus of Elasticity, Bulk Modulus, Poission Ration and its relation in between.

Stress and strain: Normal stress and strain, principle of Superposition, Deformation in stepped and composite bar.

UNIT – 3 **7L**

Thermodynamics: Macroscopic & microscopic study point of view, System, Surrounding and Universe, Phase, Property, State, Path, Process, Cyclic and non-cyclic processes, Quasi static process, Reversible and irreversible processes , Thermodynamic equilibrium, Concept of continuum, Energy and its forms, Enthalpy, Zeroth law, Different temperature scales and theory of temperature and Pressure measurement.

UNIT – 4 **8L**

Laws of Thermodynamics: Thermodynamic definition of work, Thermodynamic processes, Calculation of work in various processes and sign convention, Non-flow work and flow work, Joules' experiment, First law of thermodynamics, Internal energy and enthalpy, First law of thermodynamics applied to open systems, Steady flow energy equation and its applications, First law analysis for closed system (non flow processes), Limitations of first law of thermodynamics, PMM-I.

Statement of Second Law of Thermodynamics: Kelvin Planck's statement and Clausius statement and their equivalence.

UNIT – 5 **9L**

Power generation: Air standard cycle**,** IC Engine**,** Carnot cycle, Otto cycle, Diesel cycle, Important components of I.C.Engine, two stroke and four stoke engine, S.I. and C.I. engines, efficiency of Otto and diesel cycle

Basics of Heat Transfer: Concepts of the mechanisms of heat flows: conduction, convection and Radiation heat transfer application in engineering.

Reference Books:

1. Basu,A.R; A Text book of Engineering Mechanics(Applied Mechanics);2003 Edition; Dhanpat Rai & co.(p) Ltd, Delhi.
2. Chandramouli, P.N; Engineering Mechanics; Second Printing; PHI Learning Private Limited, Delhi; 2013.
3. Rajput, R. K; Material Science; S. K. Kataria & Sons, New Delhi.
4. Dubey, N. H; Engineering Mechanics, Statics and Dynamics; First reprint; McGraw Hill Education (India) Private Limited, New Delhi, 2013.
5. Ratan, S.S; Theory of machines; Second Edition; Tata McGraw Hill Publishing Company Limited, New Delhi.
6. Nag.P.K.; Engineering Thermodynamics; 3rd Edition; Tata McGraw Hill Publishing Company Limited, New Delhi.
7. Nag.P.K.; Heat and Mass Transfer; Tata McGraw Hill Publishing Company Limited, New Delhi.
8. Kumar.D.S; Basic of Mechanical Engineering; S. K. Kataria & Sons, New Delhi.

Essentials of Mechanical Engineering Lab

List of Experiments

1. Tensile test
2. Impact test
3. Hardness test
4. Pulley experiment
5. Experiment on conduction heat transfer
6. Demonstration of Impulse and reaction turbine
7. Study of 4s and 2S engine petrol Engine
8. Study of 4s and 2S engine Diesel Engine
9. Study of refrigerator and air conditioning

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Professional Communication – II**			Course Code: **HA2210**
Credit: **3.5**	L **3**	T **0**	P **1**
Year: **1st**			Semester: **II**

UNIT 1: **PROFESSIONAL COMMUNICATION** **(6 Hrs)**

1. Importance and Features of Business Communication, Flow and Channels of Communication in an Organization.
2. Introduction to Technical Communication, Types and History of Technical Communication.
3. Difference between General and Technical Communication, and Importance of Technical Communication.
4. Characteristic of Technical Communication, and Elements of Style.
5. Process of Preparing a Technical Document.
6. Elements and Features of Scientific Articles.
7. Compunication, E- mail, E- tools and Encyclopedia.

UNIT 2: **BUSINESS CORRESPONDENCE** **(8 Hrs)**

1. Business Correspondence – Principles, Features, Types, Format and Layout of Business Letter.
2. Inter Office Correspondence – Letters of Enquiry, Quotation, Order, Sales, and Complaint.
3. Intra Office Correspondence: Notice, Agenda, Minutes, and Memorandum.
4. Job Application Letter.

UNIT 3: **TECHNICAL PROPOSAL and TECHNICAL REPORT** **(8 Hrs)**

1. Technical Proposal - Introduction, Purpose, Features, Types, Format, Importance, and Writing Technical Proposals and Plagiarism.
2. Technical Report - Features, Types, Style, Format, Relevance, and Writing Technical Reports.

UNIT 4: CORPORATE COMMUNICATION SKILLS **(8 Hrs)**

1. Dimensions and importance of EQ
2. Interpersonal communication skills - Life Position, and Transactional Analysis
3. Johari Window: Role of Feedback and Disclosure in Communication; Accepting Criticism
4. Cross Cultural Communication
5. Attitude
6. Perception
7. Personality Attributes and Communication: Self Esteem, Self-Monitoring, Impression Management, and Locus of Control.
8. Conflict and Negotiation

UNIT 5: PROJECT **(6 Hrs)**

REPORT WRITING/ PROPOSAL WRITING

The students will write a Report **OR** a Proposal consisting of 10-15 pages.

REPORT WRITING

1. **For B.Tech. students-**
    a. Technical Report describing new machinery, a report on the sudden break down in production unit, and market survey report for formulating new market strategy.
2. **For B.Pharma. students**
    a. Technical Report based on the site inspection of a drug manufacturing unit, Survey Report on Health Awareness and Self-Medication.
3. **For B.Arch. students**

a. Technical Reports based on a Site Inspection for Geographical and Geological aspects of a particular location, A Report on the Architectural Survey of a Monument. Architectural

PROPOSAL WRITING

1. **For B.Tech. students**
   a. Technical Proposal to organize a Technical Training Program, To develop new range of a product and to start a new venture.
2. **For B.Pharma. students**
   a. Technical proposal to establish a new laboratory, To create new drug-composition and to visit to a Super Specialty Hospital.
3. **For B.Arch. students**
   a. Technical Proposal for an Archeological Site visit , To Construct New Buildings.

Report Writing and Proposal Writing carries 30 marks equivalent to three class tests.

TEXT BOOK

1. Gupta, Ruby. Advanced Technical Communication, Cambridge University Press, New Delhi. 2011.

SUGGESTED REFERENCE BOOKS

1. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011.
2. Tyagi, Kavita& Padma Misra. Advance Technical Communication, PHI, New Delhi.2011
3. Technical Communication, Cengage Learning, New Delhi.2010
4. Technical Communication, OUP, New Delhi. 2013
5. Wallace, Masters Personality Development, Cengage Learning, New Delhi.2006
6. Barrass, Robert: Students Must Write, Foundation books, Cambridge, New Delhi.2006
7. Rao, Bhaskar: Successful Career Soft Skills and Business English, BS Publications, Hyderabad.2012
8. Chakrawarthi: Soft Skills for Professionals, Wiley India.2011

Professional Communication – II Lab

Lab 1	Vocabulary Building
Lab 2	Telephone Etiquette: Making an appointment , answering Calls
Lab 3	Public Speaking
Lab 4	Group Discussion: Do's and Don'ts of GD
Lab 5 & 6	Interview Skills: Preparation
Lab 7	PP Presentation Skills: Techniques of making effective presentation
Lab 8	Meeting : Conducting meetings effectively
Lab 9	Developing Negotiating skills
Lab 10 &11	Reading Comprehension
Lab 12	Evaluation

References: (Software and Videos)

1. Wordsworth English Language laboratory software
2. Wordsworth Prep 1-2-3
3. Communicate
4. Train 2 Success
5. Additional PPTs

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Computer Programming in C++**			Course Code: **DA2210**
Credit: **4**	L **3**	T **0**	P **2**
Year: **1st**			Semester: **II**

Unit -1 **8L**

Introduction to Object Oriented Programming, including methodologies, programming techniques, Object Oriented languages.
Overview of C++ basic structures, including the main () function, C++ data types, different type of operators expressions and statements, standard Input/output, Simple flow of control, Defining user defined Functions.

Unit -2 **8L**

General overview of objects and classes, Object and classes in C++, including class definition, Defining members inside or outside, accessing of members, constructors, types of constructors, destructors and Pointer to class object.

Unit-3 **8L**

Polymorphism: function overloading, methods of overloading, constructor overloading, Operator overloading.
General overview of inheritance: Introduction, Categories of inheritance, public/protected/private inheritance, constructors and destructors in derived classes, and Virtual Base class.

Unit-4 **8L**

Function overriding and virtual functions, Abstract class and abstract base class, Friend functions, Templates in C++, function templates, class templates, templates and inheritances, templates and static members.

Unit-5 **8L**

File handing in C++: opening of file, closing of file, text files, binary files, Reading and writing into a file. Exception Handling in C++, including usage, try, throw and catch.

Text Books:

1. Kip R. Irvine, C++ and Object-Oriented Programming, Prentice Hall, 1997
2. R. Lafore, "Object Oriented Programming using C++", BPB Publications, 2004
3. E Balagurusamy "Object Oriented Programming with C++" T.M.H 2nd edition

Reference Books:

1. Schildt Herbert, "C++ Programming", 2nd Edition, Wiley DreamTech.
2. YashwantKanethkar, "Object Oriented Programming using C++",BPB, 2004

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

List of Programs in 'C++' Lab

Lab 1	(a) WAP to print first 10 prime numbers. (b) WAP to demonstrate nested loops. (c) WAP to print reverse of a given number. (d) WAP to read two numbers from keyboard and display the larger one.
Lab 2	(a) Create a class called Employee that includes three pieces of information as instance Variables – a first name (type String), a last name (type String) and a monthly salary (Double) (b) Create a constructor in above class to initialize the three instance variables. Provide a get method for each instance variable. (c) WAP to demonstrate destructors.
Lab 3	(a) Program to implement different types of inheritances like Multiple, Multilevel and hybrid. (b) Write a program in C++ demonstrating the public, protected and private parameters. (c) Write a program in C++ to demonstrate destructor in inheritance. (d) WAP to demonstrate encapsulation property of OOPs.
Lab 4	(a) Write a program that uses a class where the member functions are defined inside a class. (b) WAP that uses a class where member functions are defined outside a class. (c) WAP that uses a class where member functions are defined inside a class. (d) WAP to demonstrate the use of Static Data members.
Lab 5	(a) WAP to demonstrate the use of Dynamic Constructor. (b) WAP to demonstrate the use of function Template. (c) Illustrate and implement the C++ program to initiate the base constructor from derived class constructor.
Lab 6	(a) Write a C++ program to find the largest and smallest element of an array.
	(b) Create a class Matrix. Implement all possible matrix operations for Matrix type objects by overloading them.
Lab 7	(a) Create 2 classes OM and DB which store the value of distance. DM store distances in meters and cm and DB in feet and inches. Write a program that can read values for the class objects and add 1 object OM with another object of DB.
	(b) Define a class to represent bank account. Include the following members: **Data members** 1. Name of depositor. 2. Account number. 3. Type of account. 4. Balance amount in the account. **Member functions** 1. To assign initial values. 2. To deposit an amount. 3. To withdraw an amount after checking the balance. 4. To display name and balance. Write a main program to test the program.
Lab 8	(a) WAP to demonstrate static class data. (b) WAP to demonstrate the use of Public, Private and protected classes.
Lab 9	(a) WAP to illustrate the concept of call by reference. (b) WAP to illustrate the concept of unary operator overloading. (c) WAP to illustrate the concept of binary operator overloading.
Lab 10	(a) WAP to demonstrate the use of function overloading. (b) WAP using multiple inheritance for collecting employee details.
Lab 11	(a) WAP using function template to find maximum of two Data. (b) WAP to calculate factorial of given number using copy constructor.
Lab 12	(a) WAP to sort five float and integer numbers using template function (use bubble sort). (b) Demonstrate the use of different types of polymorphism.
Lab 13	(a) Write a function to read a matrix of size M × N from keyboard. (b) WAP to implement aggregation concept.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Environmental Science**	Course Code: **BA1010**
Credit: **2**	L **2** T **0** P **0**
Year: **1st**	Semester: **II**

Unit – 1 **(6L)**

Natural Resources: Renewable and non-renewable resources

Definition, scope, importance and need for public awareness, natural resources and associated problems.

- Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
- Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
- Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture and green revolution, water logging, salinity.
- Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources.
- Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Unit – 2 **(5L)**

Ecosystems

Concept, Structure and function of an ecosystem, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the Forest and aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit – 3 **(5L)**

Biodiversity and its conservation

Introduction – Definition: genetic, species and ecosystem diversity. Bio geographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-sports of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit – 4 **(6L)**

Environmental Pollution

Definition, Cause, effects and control measures of:-

a. Air pollution b. Water pollution c. Soil pollution
d. Marine pollution e. Noise pollution f. Thermal pollution
g. Nuclear hazards

• Solid waste Management and biomedical waste: Causes, effects and control
• Role of an individual in prevention of pollution.
• Pollution effects-global warming, acid rain, ozone depletion, smog and case studies.
• Disaster management: floods, earthquake, cyclone and landslides.

Unit – 5 **(6L)**

Social Issues and the Environment

- From Unsustainable to Sustainable development
- Water conservation, rain water harvesting, watershed management
- Environmental Impact Assessment and Resettlement and rehabilitation problems.
- Climate change
- Wetland conservation.
- Role of remote sensing and GIS in environmental monitoring and analysis
- Environment Protection Act. 1986
- Air (Prevention and Control of Pollution) Act. 1981
- Water (Prevention and control of Pollution) Act 1974
- Wildlife Protection Act 1972
- Forest Conservation Act 1980.

Field work:

- Visit to a local area to document environmental assets river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

REFERENCE BOOKS:

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad –380 013, India, Email:mapin@icenet.net (R)
2. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
3. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
4. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
5. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
6. Gleick, H.P. 1993. Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
7. Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
8. Mckinney, M.L. & School, R.M. 1996. Environmental Science Systems & Solutions, Web enhanced edition. 639p.
9. AnubhaKaushik&Kaushik, C.P. 2009.Perspectives in Environmental Studies, New Age International Publishers.
10. Manahan. S.E., Environmental chemistry, 9^{th} edition.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Engineering Graphics**	Course Code: **LA1220**
Credit: 1	L **1** T **0** P **0**
Year: **1st**	Semester: **II**

UNIT – 1

Introduction: Sheet Layout, Types of Sheet, Size of Sheets, Title blocks, Type of lines, Lettering, Dimensioning, Scale (Full, Reduced, Large) Geometrical Constructions,

UNIT – 2

Projection: Methods of Projection, Planes of Projection, Projection of points, Projection of straight lines, Projection of auxiliary planes, Projection of planes.

UNIT – 3

Projection of solids, Sections of solids.

UNIT – 4

Development of surfaces

UNIT – 5

Isometric Projections

Reference Books:

1) Bhatt N. D. & Panchal V. M, "Engineering Drawing", Charotar Publisher, 2007.
2) Dhanjay A Jolhe, "Engineering Drawing" Tata McGraw Hill, 2008.
3) Gill P.S "Engineering Graphics" S. K. Kataria & Sons, 2009
4) John K.C, "Engineering Graphics" , 2nd edition, PHI Learning Pvt. Ltd., 2010

List of Experiments

1. Introduction to AutoCAD Commands, Explaining need of AUTO CAD over Manual drafting, Simple Drawings.
2. Sheet on Lettering and Geometric construction.
3. Orthographic Projections, Basic problem based on Projection of points.
4. Sheet on Projection of Lines.
5. Sheet on Projection of Planes.
6. Sheet on Projection of Auxiliary Planes.
7. Sheet on Projection of Solids.
8. Development of Surfaces.
9. Sheet on Isometric Projections from orthogonal views.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Material Science**	Course Code: **LA3210**
Credit: 4.5	L **3** T **1** P **2**
Year: 2nd	**Semester: III**

Course Objectives:-

The scope of the material science is truly vast, covering almost all areas of science. It is the subject, spanning the physics and chemistry of the matter, engineering applications and industrial manufacturing processes. Materials scientists study the relationships between the structure and the properties of a material and how it is made, they develop new or improved materials to meet engineering specifications, and they devise processes for manufacturing them. The subject encompasses the study of a wide range of materials including metals, alloys, composites, semiconductors, superconductors, ceramics, polymers, nano-materials and biomaterials.

UNIT-I **7L**

Introduction: Historical perspective, importance of materials. Brief review of modern & atomic concepts in Physics and Chemistry, Atomic models, Periodic table, Chemical bonding.

Crystallography and Imperfections: Concept of unit cell space lattice, Bravais lattices, common crystal structures, Atomic packing factor and density. Miller indices. X-ray crystallography techniques. Imperfections, Defects & Dislocations in solids.

UNIT-II **10L**

Mechanical properties and Testing: Stress strain diagram, Ductile & brittle material, Stress vs strength, Toughness, Hardness, Fracture, Fatigue and Creep. Testings such as Strength testing, Hardness testing, Impact testing, Fatigue testing Creep testing, Non-destructive testing (NDT).

Micro structural Exam: Microscope principle and methods. Preparation of samples and Microstructure

exam and grain size determination. Comparative study of microstructure of various metals & alloys such as

Mild steel, CI, Brass.

Phase Diagram and Equilibrium Diagram: Unary and Binary diagrams, Phase rules. Types of equilibrium diagrams: Solid solution type, eutectic type and combination type. Iron-carbon equilibrium diagram.

UNIT-III **8L**

Ferrous materials: Brief introduction of iron and steel making furnaces. Various types of carbon steels, alloy steels and cast irons, its properties and uses.

Heat Treatment: Various types of heat treatment such as Annealing, Normalizing, Quenching, Tempering and Case hardening. Time Temperature Transformation (TTT) diagrams.

Non-Ferrous metals and alloys: Non-ferrous metals such as Cu, Al, Zn, Cr, Ni etc. and its applications. Various type Brass, Bronze, bearing materials, its properties and uses. Aluminum alloys such as Duralumin.

Other advanced materials/alloys.

UNIT-IV **7L**

Magnetic properties: Concept of magnetism – Dia, para, ferro Hysteresis. Soft and hard magnetic materials,

Magnetic storages.

Electric properties: Energy band concept of conductor, insulator and semi-conductor. Intrinsic & extrinsic semi-conductors. P-n junction and transistors. Basic devices and its application. Diffusion in Solid. Super conductivity and its applications. Messier effect. Type I & Type II superconductors.

UNIT-V **9L**

Ceramics: Structure, types, properties and applications of ceramics. Mechanical/Electrical behavior and processing of Ceramics.

Plastics: Various types of polymers/plastics and its applications. Mechanical behaviour and processing of plastics. Future of plastics.

Other materials: Brief description of other material such as optical and thermal materials concrete, Composite Materials and its uses. Brief introduction to Smart materials & Nano-materials and their potential applications

Performance of materials in service: Brief theoretical consideration of Fracture, Fatigue, and Corrosion and its control.

Learning Outcomes:-

- Learn to apply a knowledge of mathematics, science and engineering to material systems.
- Learn to design and conduct experiments and to analyze and interpret data.
- Learn to design a process, a microstructure, or a component to satisfy system needs.
- Be able to function on multidisciplinary teams.
- Learn to identify, formulate, and solve engineering problems.
- Learn to use the experimental, analytical, statistical, and computational tools for engineering practice in the materials discipline.
- Learn the fundamental principles underlying and connecting the structure, processing, properties, and performance of materials systems.

Text Books:

I. W.D. Callister, Jr, -" Material Science & Engineering" Addition-Wesley Publication, 7th edition,2007.

II. Er. R. K. Rajput, "Material Science,3rd ed, KATSON BOOKS.

Reference Books:

I. Van Vlack, "Elements of Material Science & Engineering", 6th edition, John Wiley & Sons, 2010.

II. V. Raghvan "Material Science", 5th edition, Prentice Hall, 2005.

List of Experiments

1. Making a plastic mould for small metallic specimen.
2. Specimen preparation for micro structural examination-cutting, grinding, polishing, etching.
3. Grain size determination of a given specimen.

4. Comparative study of microstructures of different given specimens (mild steel, gray cast iron, brass, copper etc.)
5. Heat treatment experiments such as annealing, normalizing, quenching, case hardening and comparison of hardness before and after.
6. Material identification of, say, 50 common items kept in a box.
7. Faradays law of electrolysis experiment.
8. Study of corrosion and its effects.
9. Study of microstructure of welded component and HAZ. Macro and Micro Examination.
10. Suitable experiment on Magnetic/ Electrical/ Electronic materials.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Engineering Thermodynamics**	Course Code: **LA3010**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: 2nd	**Semester: III**

Course Objectives:-

- To cover the basic principle of thermodynamics.
- To cover the concepts of energy conversion, energy exchange and energy saving.
- To understand basis of thermodynamics, applied to the design and analysis of various engineering devices involving energy interaction.

UNIT-I **8L**

Review of First law of Thermodynamics

Second Law of thermodynamics: Limitations of first law of thermodynamics, essence of 2nd law of thermodynamics, Kelvin Planck's statement of second law of thermodynamics, Clausius statement of second law of thermodynamics, Equivalence of two statements of second law of thermodynamics, Thermal reservoir, Heat engine, Heat pump, refrigerator, Reversible and irreversible process, Carnot cycle and Carnot engine, Carnot theorem and it's corollaries, thermodynamic temperature scale, PMM-II.

UNIT-II **8L**

Entropy: Definition**,** Clausius theorem, Clausius inequality, Entropy a property of system, change in entropy for process, Tds relations, entropy principle, application of entropy principle for mixing of two fluids, Third law of thermodynamics.

UNIT-III **8L**

Properties of pure substance: Pure substance, Property of steam, Triple point, Critical point, Subcooled liquid, Saturation states, Superheated states, Phase transformation process of water, Graphical representation of thermodynamic processes on P-T & P-V diagrams, T-S and H-S diagrams, Use of property diagram, Steam-Tables and Mollier charts, Dryness fraction and it's measurement.

UNIT-IV **8L**

Available energy, Exergy and Irreversibility: Source of energy, Available energy and Unavailable energy, dead state and useful work, available energy referred to a cycle, quality of energy, maximum work in a reversible process, availability of energy entering a system, availability of closed system, reversible work by an open system exchanging heat only with surroundings, useful work, dead state, availability, second law efficiency.

UNIT-V **8L**

Thermodynamic relations: properties of ideal and real gases, Helmholtz and Gibb's function,

Mathematical conditions for exact differentials. Maxwell Relations, Clapeyron Equation, JouleThompson coefficient and Inversion curve, Coefficient of volume expansion, Adiabatic & Isothermal compressibility.

Learning Outcomes:-

This course aims to provide basic understanding of the principles of energy conversion. It develops the understanding of mass, energy, heat, work, efficiency, ideal and real thermodynamic cycles and processes. It teaches first and second laws of thermodynamics, perfect gas law, properties of real gases, and the

general energy equation for closed and open systems. The subject includes the concepts of available energy and conversion of heat energy to work.

Text Books:

I. P. K. Nag, "Engineering Thermodynamics", Tata McGraw Hill Education, 2005

Reference Books:

I. M. J. Moran, H. M. Shapiro, "Fundamentals of Engineering Thermodynamics" John Wiley & Sons, 2000.
II. Cengel, Y.A. and Boles, M.A., "Thermodynamics: An Engineering Approach", 3rd Ed., Tata McGraw-Hill 2002
III. Venkatesh A, "Basic Engineering Thermodynamics", Universal Press 2007

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Strength of Materials**	Course Code: **LA3020**
Credit: 3.5	L **3** T **1** P **0**
Year: **2nd**	Semester: **III**

Course Objectives:-

The objective of the course is to study the behaviour of materials under externally applied load which includes calculation of various stresses, loads and deflections on members using governing equations and formulae. This subject serves as the basis of most fundamental concepts of design of machine elements.

UNIT-I **7L**

Simple stress and strain: Introduction and definitions; Hooke's law; true and engineering stress-strain curves; axial stress; thermal stress and strain.

Compound stress and strains: Introduction; state of plane stress; stress on an inclined plane; Maximum normal stress and strain; Mohr's stress circle.

Introduction to centre of gravity and moment of inertia of commonly used cross sections

UNIT-II **10L**

Stresses in Beams: Shear force and bending moment diagrams; bending stress in beams; shear stress in beams and shear stress distribution diagrams.

Torsion of circular shaft: Torsion equation; shaft in series and parallel; combined bending and torsion in shafts.

UNIT-III **8L**

Strain energy: Concept and application; Impact load & stresses; Castigliano's theorem.

Deflections of Beams: Introduction; differential equation of the deflected beam; Macaulay's method; Moment area method.

UNIT-IV **8L**

Thin cylinders and shells: Hoop and axial stresses and strain, volumetric strain.

Thick cylinders: Radial, axial and circumferential stresses in thick cylinders subjected to internal and external pressures; Compound cylinder.

UNIT-V **8L**

Column and strut: Combined bending and direct stress; middle third and middle quarter rules; Euler's theory of buckling of column for different end conditions; limitations of Euler's formula; Rankine's formula.

Introduction to three dimensional stress and strain: Equilibrium equation, Normal and shear-stresses and strains; Generalized Hook's Law; Theories of failure.

Learning Outcomes:-

- Analyze and design structural members subjected to tension, compression, torsion, bending and combined stresses using the fundamental concepts of stress, strain and elastic behavior of materials.
- Utilize appropriate materials in design considering engineering properties, sustainability, cost and weight.
- Perform engineering work in accordance with ethical and economic constraints related to the design of structures and machine parts.

Text Books:

I. Surendra Singh, Strength of Materials" S K Kataria, 4th Edition 2015.

II. S. Ramamurtham, "Strength of Materials", 16th edition, Dhanpat Rai Publishing Company (p) Ltd, 2011.

Reference books:

I. Stephen P. *Timoshenko.*, "Elements of Strength of Materials", 5th edition, East West, 2003.

II. Egor P. Popov, "Mechanics of Materials, 2nd edition, Pearson Education India, 2015.

III. James M. Gere, Stephen P. *Timoshenko.* "Mechanics of Materials, 2nd edition, CBS, 2006.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Manufacturing Process – I**			Course Code: **LA3030**
	L	T	P
Credit: 3	**3**	**0**	**0**
Year: **2nd**			Semester: **III**

Course Objectives:-

Students should able to know about the types of manufacturing process and selection of process of a specific operation.

UNIT – I **9L**

Introduction: Importance of manufacturing, Economic and technological considerations in manufacturing. Classification of manufacturing processes.

Metal Forming Processes: Elastic & plastic deformation, yield criteria. Hot working vs cold working.

Forging equipments and methods: hand, drop and die forging.

Rolling: Rolling mills and Rolling mills & rolled-sections, Friction angle and rolling force, no slip condition.

Drawing and Extrusion processes: Wire / strip drawing, tube drawing and extrusion processes and their applications, lubrication in metal forming operation, defects in formed parts.

UNIT – II **9L**

Sheet Metal working: Presses and their classification, Die & punch assembly and press work methods and processes, Cutting/Punching mechanism, blanking vs piercing, Compound vs Progressive die, Flatface vs Inclined-face punch and Load (capacity) needed.

Analysis of forming process like cup/deep drawing. Bending & spring-back.

Blank development force and press tonnage calculation in shearing, bending and deep drawing operations.

UNIT – III **8L**

Powder Metallurgy: Powder metallurgy manufacturing process. The need, process, advantage and applications.

Jigs & Fixtures: Locating & Clamping devices & principles, Jigs and Fixtures and its applications.

UNIT – IV **7L**

Manufacturing of Plastic components: Review of plastics, and its past, present & future uses, Injection moulding, Extrusion of plastic section. Welding of plastics. Future of plastic & its applications. Resins & Adhesives.

UNIT – V **9L**

Casting (Foundry): Basic principle & survey of casting processes, Types of patterns and allowances. Types and properties of moulding sand, Elements of mould and design considerations, Gating, Riser, Runnes, Core, Solidification of casting, Sand casting, defects & remedies and inspection. Die Casting, Centrifugal casting, Investment casting, CO_2 casting and Stir casting etc.

Learning Outcomes:-

Students will get the awareness of various manufacturing process and its selection method for specific operation. After studying this subject they will be able to identify the operation used to develop any components.

Text Books:

1. Ghosh and Malik, "Manufacturing Science" East West Press Pvt Ltd, 2nd edition, 2010.
2. R.K.Rajput, "A Textbook of Manufacturing Technology (Manufacturing Process)" Laxmi publication
3. Dr P.C.Sharma, "A Textbook of Production Technology (Manufacturing process)",S.Chand publication.

Reference Books:

1. Kalpakjian, S., and Schmid, S.R., "Manufacturing Engineering and Technology", Pearson Education 2000.
2. Rao , P.N., "Manufacturing Technology", (Vol. 2), Tata McGraw-Hill 1998.
3. R.k.jain., "Production Technology",Khanna publication ISBN: 978-81-7409-099-1.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Theory of Machines**	Course Code: **LD3210**
Credit: 4.5	L **3** T **1** P **2**
Year: **2nd**	Semester: **III**

Course Objectives:-

To expose the students the different mechanisms, their method of working, Forces involved and consequent vibration during working

UNIT I :

Introduction: Link or element, kinematic pairs, degrees of freedom, Grubler's criterion (without derivation), Kinematic chain, Mechanism, structure, Mobility of Mechanism, Inversion, Machine. Kinematics inversions of 4 bar and slide crank chain, kinematics analysis in simple mechanisms, velocity and acceleration polygons, Analytical methods. **Cams & follower**-classifications, displacement diagrams, layout of plate cam profiles, derivatives of followers motion, circular arc and tangent cams.

UNIT II :

GEARS and GEAR TRAINS

Nomenclature and classification, law of gearing, path of contact, arc of contact, interference for spur gears, involute & cycloidal profile of gear.

Gear trains: Simple, compound, reverted, epicyclical gear trains.

UNIT III :

FORCE ANALYSIS

Applied and Constrained Forces, Free body diagrams, static Equilibrium conditions, Two, Three and four members, Static Force analysis in simple machine members, Dynamic Force Analysis, Inertia Forces and Inertia Torque, D'Alembert's principle, superposition principle, dynamic Force Analysis in simple machine members.

UNIT IV :

GYROSCOPES: Gyroscopic law, effect of gyroscopic couple on automobile, ships and aircrafts.

BALANCING : Static and Dynamic balancing, Balancing of revolving and reciprocating masses, Single and multi-cylinder engine, V-engines.

UNIT V :

GOVERNORS: Introduction to governors, Watt governor, Porter governor, Proel governor, Spring loaded governor, power and sensitivity & stability of governor. Controlling force for governor

VIBRATIONS : Vibration analysis of SDOF systems, natural, damped, forced vibrations, transmissibility ratio, vibration isolation and vibration of mass supported on foundations subject of vibrations, whirling of shafts.

Learning Outcomes:-

1. Ability to understand the relative motion between various components of any given mechanism
2. Ability to synthesize a mechanism for achieving a desired motion.

Text Books:

I. Ambekar A.G., "Mechanism and Machine Theory" Prentice Hall of India, New Delhi, 2007

II. Shigley J.E., Pennock G.R and Uicker J.J., "Theory of Machines and Mechanisms", Oxford University Press, 2003

Reference Books:

I. Thomas Bevan, "Theory of Machines", CBS Publishers and Distributors, 1984.
II. Ghosh.A, and A.K.Mallick, "Theory and Machine", Affiliated East-West Pvt. Ltd., New Delhi, 1988.
III. Rao.J.S. and Dukkipatti R.V. "Mechanisms and Machines", Wiley-Eastern Ltd., New Delhi, 1992.

List of Experiments

1. To study the Different types of kinematic links, kinematic pairs and inversions of mechanisms.
2. To study different types of Gears and Gear trains.
3. To study different types of Cams and followers.
4. To perform the experiments of static and dynamic balancing on a shaft.
5. To perform the experiment on a governor and to plot the graph between r and f.
6. To perform the experiment on the Gyroscope & prove the law of gyroscope.
7. To perform an experiment on cam dynamics apparatus.
8. To calculate the frequency of a free vibrating spring.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Electrical Machines**	Course Code: **EA32L0**
Credit: 4.5	L **3** T **1** P **2**
Year: **2nd**	Semester: **III**

UNIT – I **7L**

Single phase Transformer: Construction, phasor diagram, Voltage Regulation, OC & SC Test, Polarity test, Sumpner's test, all day efficiency

Three phase Transformer: Construction: core type, shell type, three phase bank of single phase transformer, scott connection.

Autotransformer: Volt-Ampere Relationship, efficiency, advantages and disadvantages, applications.

UNIT – II **9L**

DC Machine: Construction, EMF and torque equation, Armature Reaction, Commutation, Methods to improve Commutation, performance characteristics of motors and generators, starting of motors, speed control methods, losses, efficiency, applications.

UNIT – III **8L**

Three phase Induction Motor: Constructional features, Rotating magnetic field, Principle of operation Phasor diagram, equivalent circuit, torque and power equations, Torque- slip characteristics, Speed Control, starting of squirrel cage and slip ring induction motor.

UNIT – IV **8L**

Synchronous Machine: Constructional features, Armature winding, EMF Equation, Winding coefficients, equivalent circuit and phasor diagram, Armature reaction, Working principle of synchronous generator, O. C. & S. C. tests, Voltage Regulation using Synchronous Impedance Method ,Working principle of synchronous motor, Starting torque and mechanical power developed, Effect of varying field current at different loads, V-Curves, application.

UNIT – V **5L**

Special Purpose Machines:

Two phase servomotor: Construction, working principle and application.

Stepper motor: construction, working principle and application.

Text Books:

1. Dr.P.S.Bhimbra, ―Electrical Machinery‖,Khanna Publishers India
2. D.P.Kothari & I.J.Nagrath, ―Electric Machines‖, Tata McGraw Hill

Reference Books:

1. Sen, ―Principles of Electrical Machines & Power Electronics‖, Wiley India 2. O.C. Taylor,
―The performance & design of A.C. Commutator Motors‖, A.H.Wheeler & Co(P) Ltd.

List of Experiments

Note: Minimum eight experiments are to be performed from the following list. The department may add 3 to 4 more experiments in the following list.

1) Polarity and voltage ratio test of a 1- phase transformer.
2) O.C and S.C test of 1-phase transformer
3) Sumner's test on two identical 1-phase transformers.
4) Internal and external characteristics of dc shunt motor
5) Load test on dc shunt motor.
6) Speed control of dc shunt motor.
7) Load test on 3-phase induction motor.

8) O.C and S.C test of synchronous machine.

Course Title: **MACHINE DRAWING**	Course Code: **LA3110**
	L T P
	0 0 2
Credit:1	
Year: **2nd**	Semester: **III**

Course Objectives:-

This course aims to provide basics of design of a components. Students will understand the methods that how to select the various manufacturing process for developing a components in low cost. Also they will learn the various special devices like jigs and fixture.

Machine Drawing Conventions: Need for drawing conventions, introduction to IS conventions; **(any three)**

a) Conventional representation of materials and common machine components.
b) Representation of geometrical and dimensional tolerance.
c) Representation of surface roughness and direction of lay of machining.
d) Representation of welded joints.
e) Sectional views and sectioning.

Computer aided Drafting: Generation of points, lines, curves, polygons, dimensioning, utility commands etc.Use of modeling software.

Drawing of Machine Elements and simple parts: Views of **any three** sets of the following machine elements and parts:

a) Popular forms of Screw threads, bolts, nuts, stud bolts.
b) Keys, cotter joints and knuckle joint.
c) Shaft coupling, spigot and socket pipe joint.
d) Journal, pivot and collar and foot step bearings.
e) Rivet joints for plates

Assembly Drawings: Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions; **(any one)**

a) Engine parts – stuffing boxes, cross heads, connecting rod,piston assembly.
b) Other machine parts - Screws jacks, Machine Vices, Plummer block, Tailstock.

Valves : Steam stop valve, spring loaded safety valve, feed check valve and air cock

Learning Outcomes:-

1. Able to apply the basic concept of Engg graphics.
2. Learn the basic commands of Auto Cad software.
3. Able to recognize and draw basic components of machine parts.
4. Able to learn 2D drafting and 3D modeling.
5. Able to learn sectioning of machine elements.
6. Able to assemble various machine parts.

Text Books:

I. Bhatt. N. D. and Panchal.V.M. **"**Machine Drawing"; Charotar Publishing House Pvt. Ltd. Anand (Gujrat), 388001, 49th Edition, 2014.

II. Gill P.S, "A Textbook of Machine Drawing"; S. K. Kataria & Sons Publishers, New Delhi-110002, 18th Edition, 2013

Reference Books:

I. Narayana. K.L, Kannaiah P. & Reddy K. Venkata, "Machine Drawing"; New Age International (P) Ltd. Publishers, New Delhi-110002, 4th Edition, 2012.

II. Dhawan R.K, "A Textbook of Machine Drawing"; S. Chand Publishing, New Delhi-110055.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Engineering Mathematics – III**	Course Code: **JA3010**
Credit:3.5	L **3** T **1** P **0**
Year: **2nd**	Semester: **IV**

UNIT – I **8L**

Complex variable- I

Elementary functions; limit, continuity & differentiability; Analytic Functions; Cauchy – Riemann equations; Harmonic functions; Line integral in the complex plane; Cauchy's Integral theorem; Cauchy's Integral formula for derivatives of analytic function.

UNIT – II **6L**

Complex Variables -II

Power series; Taylor's series; Laurent's series; Poles; Zeros; Singularities; Residue Theorem; Evaluation

of real integrals of the type $\int_0^{2\pi} f(\cos\theta,\sin\theta)d\theta$ and $\int_{-\infty}^{\infty} f(x)dx$.

UNIT – III

8L Special Functions

Series solution of ODE of 2nd order with variable coefficient with special emphasis to Legendre and Bessel differential equation by Frobenious method; Legendre polynomial of first kind; Bessel function of first kind and their properties.

UNIT – IV **8L**

Fourier Transform & Z-transform

Fourier integral; Fourier transform; Fourier sine and cosine transforms; Linearity, Scaling, frequency shifting and time shifting properties; Convolution theorem and its application.

Z – Transform; Properties of Z-transforms; Convolution of two sequences; Inverse Z-transform; Solution of difference equations.

UNIT – V **8L**

Partial differential equations and its Applications

Introduction to partial differential equations; Linear partial differential equations with constant coefficients of second order and their classification; Method of Separation of Variables for solving Partial Differential Equations; One-Dimensional Wave Equation; One Dimensional Heat Equation.

Text Books:

1. Brown & Churchill: **Complex Variables & Applications**, 9th edition, McGraw-Hill, 2013.
2. R. K. Jain & S. R. K. Iyenger, **Advanced Engineering Mathematics**, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.

Reference Books:

1. B. S. Grewal, **Higher Engineering Mathematics**, 42th Edition, Khanna publication, New Delhi, India, 2012.
2. E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, John Wiley & Sons, U.K., 2006.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Manufacturing Process-II**	Course Code: **LA4210**
	L T P
Credit:4	**3 0 2**
Year: 2nd	**Semester: IV**

Course Objectives:

To understand the concept and basic mechanics of metal cutting, working of standard machine tools such as lathe, shaping and allied machines, milling, drilling and allied machines, grinding and Non-conventional process.

UNIT – I **8L**

Metal Cutting and Machine Tools: Mechanics of metal cutting. Geometry of tool and nomenclature as per ASA system. Comparison between orthogonal and oblique cutting. Mechanics of chip formation and types of chips. Shear angle relationship. Merchant's force circle diagram. Calculations of cutting forces and power required. Cutting fluids/lubricants. Tool materials. Tool wear and tool life. Machinability.

Brief introduction to machine tool vibration and surface finish. Economics of metal cutting.

UNIT – II **8L**

Machine Tools: Lathe: Principle, types, operations, Turret/capstan, semi-automatic, automatic lathes.

Shaper, slotter, planer: operations & drives.

Milling: Milling cutters, up & down milling. Dividing head & indexing, Drilling and boring: Drilling, boring, reaming tools, Geometry of twist drills.

UNIT – III **10L**

Grinding and Super finishing:

Grinding: Grinding wheels, abrasive, cutting action. Grinding wheel- specifications, attritions wear, fracture wear, dressing and truing. Maximum chip thickness and Guest criteria. Surface and cylindrical grinding, Center less grinding.

Super finishing: Honing, lapping, and polishing.

Surface finish: description and measurements.

Limits, Fits & Tolerance: Introduction to Limits, Fits, Tolerances and IS standards, Interchangeability and standardization.

UNIT – IV **8L**

Metal Joining (Welding): Survey of welding and allied processes, Gas welding and cutting process & equipments. Arc welding: Power sources and consumables. TIG & MIG processes and their parameters Resistance welding-spot, seam projection etc. Other welding processes such as atomic hydrogen, submerged arc, electro slag, friction welding, soldering and brazing.

Thermodynamic and Metallurgical aspects in welding Shrinkage/residual stress in welds. Distortions & Defects in welds and their remedies, Weld decay in Heat affected Zone.

UNIT – V **8L**

Introduction to non-conventional Manufacturing Process: Benefits, application and working principle of EDM, ECM, LBM, EBM, USM. AJM, WJM.

Non-conventional welding application such as LBW, USW, EBW, Plasma arc welding, Explosive welding and Explosive Forming.

Learning Outcomes:

Upon completion of this course, the students can able to understand and compare the functions and applications of different metal cutting tools and also demonstrate the Nonconventional machining Process.

Reference books:

1. PandeyP.C. &Singh, C.K., ―Production Engineering‖, Standard Publisher Ltd, 1980. 2.
Ghosh, A. and Malik, A.K., ―Manufacturing Science‖, East West Press Ltd, 2010.
3. Sharma, P.C., ―Production Technology‖, S.Chand Publication, 2013.
4. Rao, P.N., ―Manufacturing Technology Vol. III‖, Tata McGraw Hills, 2013.

List of Experiments

1. Design of pattern for a desired casting (containing hole).
2. Pattern making.
3. Making a mould (with core) anjd casting.
4. Sand testing (at least one such as grain fineness number determination).
5. Injection moulding with plastics.
6. Forging hand forging processes.
7. Forging - power hammer study & operation.
8. Tube bending with the use of sand and on tube bending m/c.
9. Press work experiment such as blanking/piercing, washer, making etc.
10. Wire drawing/extrusion on soft material.
11. Rolling-experiment.
12. Bending & spring back.
13. Powder metallurgy experiment.
14. Jigs & Fixture experiment.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Basic Automobile Engineering**	Course Code: **LD4210**
	L T P
	3 1 2
Credit:4.5	
Year: **2nd**	Semester: **IV**

COURSE OBJECTIVES:

Study of the constructional details and theory of important drive line, structural, steering, braking and suspension systems of automobiles. Problem–Solving in Steering Mechanism, Propeller Shaft, Braking and suspension Systems are to be done.

Unit I Introduction

Classification of vehicles two wheelers, three wheelers and four wheeled vehicles, application & capacity, study of main specifications. Location of Prime mover, Chassis Types Parts of an automobile.

Unit II Clutches

Necessity of clutch, working of clutch, types of clutches –, single plate, multiple plate, fluid flywheel, clutch assembly, constructional & working details, friction disc, clutch lining materials, clutch pedal free play Problems

Unit III Transmission

Introduction, functions of transmission, necessity of transmission, manual transmission, sliding mesh gearbox, constant mesh gear box, synchromesh gear boxes, awareness of automatic transmission Problems

Unit IVSteering System

Steering system requirements, front axle details & geometry, Castor, Camber, Toe in, Toe out, steering geometry, steering linkages, basic types of steering gear boxes, constructional details.

Unit V Braking System

Classification of brakes, drum brakes and disc brakes, constructional & working details, introduction to hydraulic brake, parking brake, vacuum assisted Brakes, leading & trailing brake shoes, Working of tandem master cylinder wheel cylinders, Characteristics of brake fluid. Problems

LEARNING OUTCOMES:

The students will understand the constructional, working principle of various sub system of an automobile.

Text Books

1. Automotive Technology by Sethi, TMH, New Delhi
2. Automobile Engineering by K.K. Ramalingam, Scitech Publication, Chennai – 2001
3. Automotive Chassis & Body by P.L. Kohli, TMH, New Delhi

Reference Books

1. Motor Vehicles by Newton Steeds and Garrot, Butterworths, London – 2000.
2. Mechanism of the Car by Judge A.W, Chapman and Halls Ltd., London –1986

List of Experiments

1. To study the construction and prepare the layouts of front engine/ rear engine drive lines.
2. To study the construction and prepare the layout of four wheel drive line.
3. To study the construction of single plate & multi plate clutches and draw sketches.
4. To study the construction of diaphragm type clutch and draw sketches.
5. To study and prepare layouts of sliding mesh and constant mesh gear boxes.
6. To study construction of front & rear system and draw sketches.
7. To study the construction of steering system for manual/power arrangement draw sketches.
8. To study the construction of hydraulic braking systems (Disc / Drum) and functioning of master and wheel cylinders and draw sketches.
9. To study the construction of different types of automobile wheels and tyres and draw sketches.
10. To study the construction and prepare layouts of different type of cooling system.
11. To study the construction of power assisted braking system and draw sketches.
12. To study and prepare the layout of lubrication system in automobiles.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Fluid Mechanics & Machinery**	Course Code: **LD4220**
Credit:4.5	L: **3** T: **1** P: **2**
Year: **2nd**	Semester: **IV**

Course Objectives:

- The applications of Bernoulli theorem to various discharge measurement devices.
- The applications of the conservation laws to flow through pipes and hydraulic machines are studied.
- To understand the importance of dimensional analysis.
- To understand the importance of various types of flow in pumps and turbines.

Unit I

Basic Concept & Properties: Fluid, Definition, Properties of Fluids, Density, Specific Weight, Specific Volume, Specific Gravity, Temperature, Viscosity, , Vapour Pressure, Capillary and Surface Tension, Fluid Statics: Concept of Fluid Static Pressure, Absolute and Gauge Pressure Measurements by Manometers and Pressure Gauges.

Unit II

Fluid Kinematics: Fluid Kinematics - Flow Visualization, Lines of Flow, Types of Flow, Velocity Field and Acceleration, Continuity Equation, Equation of Streamline, Stream Function, Velocity Potential Function..

Unit III

Fluid Dynamics: Equations of Motion- Euler's Equation, along a Streamline, Bernoulli's Equation, Applications, Venturimeter, Orifice Meter, Other Flow Measurement Instruments, Pilot Tube. Dimensional Analysis Dimensional Numbers, Their Application, Buckingham's Theorem, Applications, Similarity Laws and Models.

Unit IV

Incompressible Fluid Flow: Viscous Flow, Shear Stress, Pressure Gradient Relationship Laminar Flow Between Parallel Plates, Laminar Flow Through Circular Tubes (Hagen Poiseulle's), Darcy Weisback's Equation, Pipe Roughness, Friction Facto, Minor Losses, Flow Through Pipes in Series and in Parallel, Boundary Layer Flows, Boundary Layer Thickness, Boundary Layer Separation, Drag and Lift Coefficients.

Unit V

Fluid Machines: Definition and Classification, Euler's Equation, Impact of Jet on Flat, Curved & Moving Plates Velocity Vector Diagram's

Hydraulic Turbines: classification of hydraulic turbine. **Impulse turbines**, Pelton wheel-constructional details, velocity triangles, power and efficiency calculations. **Fransis and Kaplan turbines**- constructional details, velocity triangles, power and efficiency calculations,

Hydraulic Pumps: Compressor & Fans: Pump Classifications. Centrifugal Pump-Working Principles, Velocity Triangles, Specific Speed,. Reciprocating Pump-Working Principles, Indicator Diagram, Work Saved by Air Vessels. Cavitation in Pumps

Learning Outcomes:

Upon completion of this course, the students can able to apply mathematical knowledge to predict the properties and characteristics of a fluid. Also, it build up to perform critical analysis on pumps & turbine.

Reference Books:

1. White, F.M., Fluid Mechanics‖, McGraw Hill Pvt. Ltd., 7th edition, 2011. 2. Munson, ―Fundamentals of Fluid Mechanics‖, Willey India Pvt Ltd, New Delhi, 6th edition, 2010.

2. Duglas, J. Fluid Mechanics‖, Pearson Ltd, 14th edition, New Delhi, 2013.
3. Bansal R. K., Fluid Mechanics and Hydraulic Machine, Lakshmi Publications, New Delhi. 5. Bansal R. K., A Text Book of Fluid Mechanics and Hydraulic Machine‖, Lakshmi Publications, New Delhi, 2010.
4. Modi P.N and Seth S. M., ―Hydraulics and Fluid Mechanics‖, Standard Book House, New Delhi.

List of Experiments

1. Verification of Bernaulli's Theorem.
2. To calibrate an orifice meter and venturie meter, and determination of the co-efficient of discharge.
3. Determination of Metacentric height for a floating ship
4. To study the transition from laminar to turbulent flown in a circular pipe.
5. To determine the coefficient of impact jet vane combination by comparing the actual force with the theoretical force for stationary vanes of different shapes.
6. To find out Pelton wheel turbine efficiency by comparing the fluid energy to mechanical energy.
7. To find out the performance of Francis turbine.
8. To study the performance of centrifugal pump.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Automotive Fuel and Lubricants**	Course Code: **LD4230**
	L T P
Credit: 4	**3 0 2**
Year: **2nd**	Semester: **IV**

Learning Objectives:

- To understand the properties of fuels and lubricants for the design and operation of the I.C engines
- To study about the automotive fuel properties and combustion.

UNIT I MANUFACTURE OF FUELS AND LUBRICANTS

Structure of petroleum, refining process, fuels, thermal cracking, catalytic cracking, polymerization, alkylation, isomerization, blending, products of refining process. Manufacture of lubricating oil base stocks, manufacture of finished automotive lubricants.

UNIT II THEORY OF LUBRICATION

Engine friction: introduction, total engine friction, effect of engine variables on friction, hydrodynamic lubrication, elasto hydrodynamic lubrication, boundary lubrication, bearing lubrication, functions of the lubrication system, introduction to design of a lubricating system.

UNIT III LUBRICANTS

Specific requirements for automotive lubricants, oxidation deterioration and degradation of lubricants, additives and additive mechanism, synthetic lubricants, classification of lubricating oils, properties of lubricating oils, tests on lubricants. Grease, classification, properties, test used in grease.

UNIT IV PROPERTIES AND TESTING OF FUELS

Thermo-chemistry of fuels, properties and testing of fuels, relative density, calorific value, flash point, fire point, distillation, vapour pressure, spontaneous ignition temperature, viscosity, pour point, flammability, ignitability, diesel index, API gravity, aniline point, carbon residue, copper strip corrosion etc.

UNIT V COMBUSTION & FUEL RATING

SI Engines – flame propagation and mechanism of combustion, normal combustion, knocking, octane rating, fuel requirements. CI Engine, mechanism of combustion, diesel knock, cetane rating, fuel requirements. Additive - mechanism, requirements of an additive, petrol fuel additives and diesel fuel additives – specifications of fuels.

Learning Outcome:

At the end of the course, the student can understand the importance, manufacturing methods, testing methods, combustion methodology of automotive fuels and lubricants**.**

TEXT BOOKS:

1. Ganesan.V., "Internal Combustion Engineering", Tata McGraw-Hill Publishing Co., New Delhi,2003.
2. Mathur. M.L., Sharma. R.P. "A course in internal combustion engines", Dhanpatrai publication,2003.
3. Obert.E.F "Internal Combustion Engineering and Air Pollution", International book Co., 1988.

REFERENCES:

1. Brame, J.S.S. and King, J.G. – "Fuels Solids, Liquids, Gaseous". Edward Arnold, 1961
2. Francis, W, "Fuels and Fuel Technology", Vol. I & II, Pergamon, 1965
3. Hobson, G.D. & Pohl.W "Modern Petroleum Technology", 1974

List of Experiments

1. Temperature dependence of viscosity of lubricants & Fuels by Redwood Viscometer.
2. Viscosity Index of lubricants & Fuels by Saybolt Viscometer
3. Flash and Fire points of diesel, K- Oil, Bio Diesel.
4. Flash and Fire points of lubricants.
5. Drop point of grease and mechanical penetration in grease.

6. Calorific value of liquid fuel.
7. Calorific value of gaseous fuel.
8. Study of semi-solid lubrication in various automobiles Units & Joints.
9. Study of lubrication in transmission, final drive, steering gear box.
10. Study of analytical equipment for oil analysis.
11. To find volatility characteristics of different fuels by ASTM distillation methods (diesel, gasoline lubricants).

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Machine Design – I**	Course Code: **LA4020**
Credit: 3.5	L **3** T **1** P **0**
Year: **2nd**	Semester: **IV**

Course Objectives

- To familiarize the various steps involved in the Design Process
- To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.
- To learn to use standard practices and standard data
- To learn to use catalogues and standard machine components

UNIT – I **6L**

Introduction: Definition, Methods, standards in design & selection of preferred size.

Selection of materials for static & fatigue loads, Materials for components subjected to creep, BIS system of designation of steels, steels.

UNIT – II **9L**

Design against static load: Modes of failure, Factor of safety, stress-strain relationship, principal stresses, theories of failure

Design against fluctuating load: stress concentration, stress concentration factors, Fluctuating/alternating stresses, fatigue failure, endurance limit, design for finite & infinite life, Soderberg & Goodman criteria, S-N curve.

UNIT – III **9L**

Design of Joints: Welded joint, screwed joints, eccentric loading of above joints, joint design for fatigue loading.

Shaft, keys & coupling: Design against static and fatigue loads, strength & rigidity design, Selection of square, flat keys and splines, rigid and flexible couplings.

UNIT – IV **8L**

Mechanical springs: Design of Helical and leaf springs, against static & fatigue loading.

UNIT – V **8L**

Design analysis of Power Screws: Form of threads, square threads, trapezoidal threads, stresses in screw, design of screw jack.

Learning Outcomes:

Upon completion of this course, the students can able to successfully design machine components.

Reference books:

1. Mechanical Engineering Design – Joseph E. Shigley, McGraw Hill Publications, 8th Edition, 2008
2. Design of Machine Elements-V.B. Bhandari, Tata McGraw Hill Co., 3r Edition, 2010
3. M.F Spotts, T.E Shoup, L.E. Hornberger, S.R Jayram and C V Venkatesh, *Design of Machine Elements*, 8th Ed., Pearson Education, 2006
4. Machine Design-Sharma and Agrawal, S.K. Katara & Sons.
5. Faculty of Mechanical Engineering, PSGCollege of Technology, ―Design Data Book ", DPV Printers, 1993.
6. Machine Design Data Book, V B Bhandari, 1st Edition, 2014, McGraw Hill Education (India) Pvt. Ltd.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Industrial Tour**	Course Code: **LA4410**
	L T P
Credit: 1	**0 0 2**
Year: **2nd**	
	Semester: **IV**

Duration: 1 week

Visit to the industry to make the students familiar with various industrial processes and systems.

Course Title: **Value Addition Training**	Course Code: **LA4Z11**
	L T P
Credit: 1	**0 0 2**
Year: **2nd**	
	Semester: **IV**

Training on commercial modeling software's.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

AUTOMOTIVE TRANSMISSION
SEMESTER - V

Subject Code	**LD6010**
Marks	100
Number of Lab Hours / Week	0
Total Number of Contact Hours / Sem	4x13=52
CREDITS	3.5 (LT P 3 1 0)

COURSE OBJECTIVES:

This course imparts basic knowledge to students with respect to current transmission system of automobiles and impart knowledge that will enable the student to analyze and lay out a drive train system

COURSE OUTCOMES:

After completing this course, the students can:

CO1: Determine various parts and types of gear box.
CO2: Understand phenomena of Hydrodynamics and Hydrostatic Drives.

Particulars	Hours
Unit 1: Gear Trains:	
Synthesis of simple, compound reverted gear trains, analysis of epicycle gear trains, problems. Necessity & function of gear boxes in Automobiles, method of calculation of gear ratios for vehicles, performance characteristics in different speeds, different types of gear boxes-sliding constant mesh, synchromesh, epi-cyclic and automatic, speed synchronizing devices, free-wheeling mechanism, overdrives, gear materials, lubrication. Planetary gearboxes, Ford T-model Wilson Gear box, determination of gear ratios, automatic overdrives.	12
Unit 2: Fluid Coupling & Torque conversion:	
Fluid coupling advantages & limitations, constructional details, torque capacity, slip in fluid coupling, performance characteristics, measure to reduce drag in fluid coupling. Faults & remedies. Single, multi stage and poly-phase torque converters, performance characteristics.	**8**
Unit 3: Automatic Transmission:	
Relative merits and demerits when compared to conventional transmission, automatic control of gears, study of typical automatic transmissions used in Indian vehicles, Ford & Chevrolet drive.	7
Unit-4: Hydrostatic Drives:	
Advantages and disadvantages, principles of hydrostatic drive systems, construction and working of typical hydrostatic drives, Janney Hydrostatic drive. Electrical drives: advantages and limitations, principles of Ward Leonard system of control Modern electric drive for buses and performance characteristics.	7
Unit- 5: Drive line:	
Effects of driving thrust and torque reaction. Hotchkiss drive. Torque tube drive, radius rods. Propeller shaft. Universal joints. Final drives – different types, double reaction final drive. Two speed rear axle. Rear axle construction – full floating, three quarter floating and semi-floating arrangements. Differential – conventional type, non-slip type. Differential locks.	6

Text Books

1. Motor Vehicle by Newton and Steeds, Illiffee Publisher - 2000
2. Modern Transmission system by Judge AW, Chapman & Hall

Reference Books

1. Passenger Car Automotive Transmissions by Design Practices, SAE Hand book – 1994.
2. Torque converters by Heldt P.M., Chilton Book Co.-1992
3. Automotive Transmission and power trains constructions by Crouse WH, Anglin DL, McGraw- Hill

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

HEAT TRANSFER SEMESTER - V	
Subject Code	**LD5220**
Marks	100
Number of Lecture Hours/Week	3
Total Number of Lecture Hours	6 x 13=78
CREDITS	4.5 (LTP 3 1 2)

COURSE OBJECTIVE:
To build a solid foundation in heat transfer exposing students to its three basic modes of conduction, convection and radiation. Introduction to governing equations with solution of practical problems using empirical correlations.

COURSE OUTCOME
After completing the course, the students will be able to

CO1: Formulate and analyze a heat transfer problem involving any of the three modes of heat transfer.

CO2: Analyze heat transfer through fins and unsteady state heat conduction problems.

CO3: Analyze convective heat transfer cases using exact, approximate, and empirical methods.

CO4: Design heat exchange devices and understand boiling and condensation heat transfer.

CO5: Analyze radiative heat exchange between black and gray surfaces.

Particulars	Hours
Unit 1: INTRODUCTION TO HEAT TRANSFER	
Introduction to three modes of heat transfer, Derivation of heat balance equation- Steady one dimensional solution for conduction heat transfer in Cartesian, cylindrical and spherical geometry, concept of conduction and film resistances, critical insulation thickness.	8
Unit 2: FINS & TRANSIENT CONDUCTION	
Heat transfer through fins of uniform cross-section, lumped system approximation and Biot number-approximate solution to unsteady conduction heat transfer by the use of Heissler charts.	8
Unit 3: CONVECTIVE HEAT TRANSFER	
Heat convection, basic equations, boundary layers, Forced convection, external and internal flows, Natural convective heat transfer, Dimensionless parameters for forced and free convection heat transfer, Correlations for forced and free convection, Estimating heat transfer rates in laminar and turbulent flow situations using appropriate correlations for free and forced convection.	8
Unit 4:BOILING, CONDENSATION &HEAT EXCHANGERS	
Boiling and condensation heat transfer, pool boiling curve, types of heat exchangers, analysis and design of heat exchangers using both LMTD and ε-NTU methods.	8
Unit 5: RADIATION HEAT TRANSFER	
Basic radiation concepts, definitions of radiative properties, radiation laws, black and gray body radiation, shape factor, black-body radiation exchange, radiation exchange between non-blackbodies in an enclosure, Infinite parallel Planes, radiation shields.	8

TEXT BOOKS

1. Cengel, Y.A. and Ghajar, A.J. "Heat and Mass Transfer", Tata McGraw Hill Co.Ltd, 4th, edition, 2013.
2. Incropera, F.P., "Fundamentals of Heat & Mass Transfer", Wiley Publication, 6th edition, 2013.

REFERENCE BOOKS

1. Kreith, F. and Bohn, M.S., "Principles of Heat Transfer", Brooks/Cole, 6th edition, 2006.
2. Holman, J.P., "Heat Transfer", TataMcGraw-Hill Publishing Company Limited, 6th edition, 2008.
3. Thirumaleswar, M., "Fundamentals of Heat and Mass Transfer", Pearson Education, 1st edition, 2013.
4. Bejan, A., "Heat Transfer John Wiley", 1993.
5. Massoud K., "Principles of Heat Transfer", John Wiley, 2002.

LIST OF EXPERIMENTS:

1. Conduction - Determination of thermal conductivity of metal.
2. Conduction - Composite wall experiment.
3. Convection - Experiment on heat transfer from tube-natural convection.
4. Convection - Heat transfer through fin-natural convection.
5. Convection - Heat transfer through fin-forced convection.
6. Convection - Heat transfer from forced convection from tube.
7. Heat exchanger - Parallel flow experiment.
8. Heat exchanger - Counter flow experiment.
9. Determination of Stefan - Boltzman constant.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Mechanical Measurements**	Course Code: **LA5230**
Credit: 4.5	L **3** T **1** P **2**
Year: **3rd**	Semester: **V**

UNIT – I **6L**

Basic Concepts of Measurements: Introduction to measurement and measuring instruments, Generalized measuring system and functional elements, units of measurement, static and dynamic performance characteristics of measurement devices, calibration, standards of measurements, concept of error, sources of error, statistical analysis of errors.

Sensors and Transducers: Types of sensors, types of transducers and their characteristics.

Signal transmission and processing: Devices and systems. Signal Display & Recording Devices

UNIT – II **9L**

Strain measurement: Types of strain gauges and their working, strain gauge circuits, temperature compensation. Strain rosettes, calibration.

Measurements of force and torque: Different types of load cells, elastic transducers, pneumatic & hydraulic systems.

Vibration Measurement: Seismic instruments, vibration pickups and decibel meters, vibrometers accelerometers.

UNIT – III **9L**

Angular and Taper Measurements: Introduction; Working principle & construction of Angular Measuring

Instruments like Protractors, Sine bars, Sine Centre, Angle gauges, Spirit level, Clinometers, angle dekkor; Applications, Advantages & limitations of commonly used angular measuring instruments; Taper Measuring instruments: Measurement of taper shafts & holes.

UNIT – IV **8L**

Screw Thread Measurements: Introduction & classification of Threads; Elements, Specification & forms of Screw Threads; Various Methods for measuring elements of External & Internal Screw Thread; Screw Thread Gauges; Errors in Threads.

Gear Measurements: Measurement and testing of spur gear: Various methods of measuring tooth thickness, tooth profile & pitch; Gear Errors.

UNIT – V **8L**

Temperature Measurement: Introduction; Temperature and Temperature Scales; Methods of temperature Measurement; Expansion thermometers; Filled System thermometers; Electrical temperature measuring instrument; Pyrometers; Calibration of temperature measuring instruments.

Pressure Measurement: Introduction; Pressure standards and methods of pressure measurement;

Manometers; Elastic pressure transducers; Measurement of Vacuum; Force balance pressure gauges; Electrical pressure transducers; pressure

Switches; Calibration of pressure measuring instruments, Maintenance and repair of pressure measuring instrument; Trouble shooting.

Reference Books:

1. R.K. Rajput, "Mechanical Measurements & Instruments", 3rd edition, 2007-2008
2. Beckwith, Marangoni, Lienhard, "Mechanical Measurements", 5th edition, 2003
3. A.K. Sawhney and P. Sawhney, "Mechanical Measurements and Instrumentation", 12th edition, 2001
4. Doeblin, "Measurement Systems", 5th edition, 2004

MECHANICAL MEASUREMENTS LAB

List of Experiments

1. Study & working of simple measuring instruments- Vernier calipers, micrometer, tachometer.
2. Measurement of effective diameter of a screw thread using 3 wire method.
3. Measurement of angle using sinebar & slip gauges. Study of limit gauges.
4. Study & angular measurement using level protector.
5. Study of dial indicator & its constructional details.
6. Study and understanding of limits, fits & tolerances.
7. Study of Pressure & Temperature measuring equipments.
8. Strain gauge measurement.
9. Speed measurement using stroboscope.
10. Flow measurement experiment.
11. Vibration/work measuring experiment.
12. Experiment on Dynamometer

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Industrial Engineering & Management**	Course Code: **LA5010**
Credit: 3	L **3** T **0** P **0**
Year: **3rd**	Semester: **V**

UNIT – I **6L**

Production, Production systems and Productivity:

Definition of production, factors of production, types of production systems. Definition of productivity, application and advantages of productivity, Improvement tools, reasons for increase and decreases in productivity

UNIT – II **9L**

Location Selection and Plant Layout:

Nature of Location Decision, Importance of Plant Location, Dynamic Nature of Plant Location, Choice of site for selection, State regulations on location, Government policies on decentralization. Industrial Estates, Economic Survey of Site selection, Comparison of location,

Principles of Plant layout and Types, factors affecting layout, methods, factors governing flow pattern, travel chart, analytical tools of plant layout, layout of manufacturing shop, repair shop and services sectors.

UNIT – III **9L**

Production Planning and Control:

Types of production systems and their characteristics functions and objectives of P.P.C., product design and development including standardization and simplification,

Sales forecasting, concept, techniques, application, production planning and process planning,

Sequencing, loading and scheduling, techniques and their selection, line of balance, assembly line balancing, dispatching, progress control.

UNIT – IV **8L**

Inspection and Statistical Quality Control:

Inspection – functions, types, objectives and benefits, quality control – principles, Concepts of quality circles, Total quality management, Quality assurance, Quality audit, ISO, and six sigma.

SQC Concept, variable and attributes, normal distribution curves and its property charts for variable and attributes and their applications and interpretation (analysis) process capability, Acceptance sampling, sampling plans, OC curves and AOQ curves.

UNIT – V **8L**

Basics of Management: introduction, definition of management, functions of management – planning, organising, staffing, directing, co-ordination, controlling, motivating, communication, decision making.

Principles of management, administration and management, nature of management, levels of management, managerial skills, managerial roles, styles of management.

Forms of organisation – line, staff, line-staff

Forms of ownership – partnership, joint stock, cooperative society, govt. sector etc.

Reference Books:

1. Riggs, "Production System, Planning, Analysis and Control", Wiley, 3rd ed. 1991.
2. Mahajan, "Industrial Engineering and Production Management", Dhanpat Rai & Co., 2005.
3. Martand Telsang, "Industrial Engineering and Production Management", S.Chand & Co.,2nd ed. 2006.
4. Banga and Sharma, "Industrial Engineering and Production Management", Khanna publishers.
5. Shankar, "Industrial Engineering and Management",Galgotia Publications Pvt. Ltd, 1st ed. 2000 (Reprint 2006).
6. Khanna, "Industrial Engineering and Management", Dhanpat Rai Publications, 17th edition 2010.

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Course Structure for B.Tech. (ME-AE)
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Course Title: **Machine Design–II**	Course Code: **LA5020**
Credit: 3.5	L **3** T **1** P **0**
Year: **3rd**	Semester: **V**

UNIT – I **8L**

Spur Gear: Tooth forms, System of gear teeth, contact ratio, Standard proportions of gear systems, Interference in involute gears, Backlash, Selection of gear materials, Gear manufacturing methods, Design considerations, Beam strength of gear tooth, Dynamic tooth load, Wear strength of gear tooth, Failure of gear tooth, Design of spur gears, AGMA and Indian standards.

UNIT – II **8L**

Helical Gear: Terminology, Proportions for helical gear, Beam strength and wear strength of helical gear, herringbone gear, crossed helical gear, Design of helical gears.

Worm Gear: Types of worm, Terminology, Gear tooth proportions, Efficiency of worm gear, Heat dissipation in worm gearing, Strength and wear tooth load for worm gear, Design of worm gearing.

UNIT – III **8L**

Sliding Contact Bearing Types, Selection of bearing, Plain journal bearing, Hydrodynamic lubrication, Properties and materials, Lubricants, Hydrodynamic journal bearing, Heat generation, Design of journal bearing, Thrust bearing-pivot and collar bearing, Hydrodynamic thrust bearing.

UNIT – IV **8L**

Rolling Contact Bearing Advantages and disadvantages, Types of ball bearing, Thrust ball bearing, Types of roller bearing, Selection of radial ball bearing, Bearing life, Selection of roller bearings, Dynamic equivalent load for roller contact bearing under constant and variable loading, Reliability of Bearing, Selection of rolling contact bearing, Lubrication of ball and roller bearing, Mounting of bearing.

UNIT – V **8L**

I. C. Engine parts

Selection of type of IC engine, General design considerations, Design of Cylinder and cylinder head; Design of piston, piston ring and gudgeon pin; Design of connecting rod; Design of center crankshaft.

Reference Books:

1. Waldron M.B. & Waldron K.J., "Mechanical Design Theory and Methodology" Springer India, 2nd Edition 2007.
2. Juvinall Robert C. "Machine Design" Wiley Publication, India, 5th Edition 2011
3. Spott M. F "Design of Machine Elements" Prentice Hall India, 3rd Edition 2013
4. Sharma and Agrawal "Machine Design" S.K. Katara & Sons, 1st Publication 1997.
5. Bhandari V. B."Design of Machine Elements" Tata McGraw Hill Co., 3rd Edition 2013.
6. Gitin M. Maitra "Handbook of Gear Design" Tata McGraw Hill Co., 2nd Edition 1994.
7. Alex Vallance & Doughtie V.I. "Design of Machine Members" Tata McGraw Hill Co., 4th Edition 1964.
8. Black P. H. & Adams O. E. "Design of Machine Elements" Tata McGraw Hill Co., 3rd Edition 1968.

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
Batch: 2016-20

Course Title: **Internal Combustion Engines**	Course Code: **LA6210**
Credit: 4.5	L **3** T **1** P **2**
Year: **3rd**	Semester: **VI**

UNIT – I **9L**

Introduction to I.C Engines: Engine classification, Air standard cycles, Otto, Diesel, Stirling, Ericsson cycles, Actual Cycle analysis, Two and four stroke engines, SI and CI engines, Valve timing diagram, Rotary engines, Stratified charge engine.

Fuels: Fuels for SI and CI engine , important qualities of SI engine fuels, Rating of SI engine fuels, Important qualities of CI engine fuels, Dopes, Additives, Gaseous fuels, LPG, CNG, Biogas, Producer gas, Alternative fuels for IC engines.

UNIT – II **9L**

SI Engines: Carburetion, Mixture requirements, Carburetor types Theory of carburetor, MPFI. Combustion in SI engine, Flame speed, Ignition delay, Abnormal combustion and it's control, Combustion chamber design for SI engines.

Ignition system requirements, Magneto and Battery ignition systems, Ignition timing and spark plug, Electronic ignition, Battery and its types, Charging and discharging of batteries.

UNIT – III **8L**

CI Engines: Fuel injection in CI engines, Requirements, Types of injection systems, Fuel pumps, Fuel injectors, Injection timings.

Combustion in CI engines, Ignition delay, Knock and its control, Combustion chamber design of CI engines.

Scavenging in 2 Stroke engines, Pollution and its control.

UNIT – IV **9L**

Engine Cooling: Different cooling systems, Cooling Towers, Radiators and cooling fans.

Lubrication: Engine friction, Lubrication principal, Type of lubrication, Lubrication Oils, Crankcase ventilation.

Supercharging: Effect of altitude on power output, Types of supercharging.

UNIT – V **7L**

Testing and Performance: Performance parameters, Basic measurements, Blow by measurement, Testing of SI and CI engines. Heat balance sheet.

Reference Books:

1. V. Ganesan, "Internal Combustion Engines", Tata Mc Graw Hill Publishers, 4th Edition.
2. M.L.Mathur & R.P.Sharma, "A Course in International Combustion Engines", Dhanpat Rai & Sons.4th Ed, 2005.
3. R. K. Rajput, "A A Textbook of Internal Combustion Engines", Laxmi Publication, 2nd edition, 2005 .
4. Colin R.Ferguson, Allan Thomson Kirkpatrick, "Internal combustion engines" John Wiley & Sons, 2nd ed, 2000.

Internal Combustion Engines Lab : List of Experiments

1. Study & experiment on 2- Stroke diesel and diesel engine.
2. Study & experiment on 4- Stroke petrol and diesel engine.
3. Performance Analysis of Four stroke S.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.
4. Determination of Indicated H.P. of I.C. Engine by Morse Test.
5. Performance Analysis of Four stroke C.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.
6. Study & experiment on Ignition system of I.C. Engine.
7. Study & experiment on Fuel Supply System of S.I. Engines- Carburetor, Fuel Injection Pump and MPFI.
8. Study & experiment on Fuel Supply System of C.I. Engines- Injector & Fuel Pump.
9. Experiment on Exhaust Gas Analysis of an I.C. Engine.

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VEHICLE MAINTENANCE 2018
SEMESTER - VI

Subject Code	**LD6210**
Marks	100
Number of Lab Hours / Week	2
Total Number of Contact Hours / Sem	6x13=78
CREDITS	4.5 (LT P 3 0 3)

COURSE OBJECTIVES:

To make the student understand the need for vehicle maintenance and its importance and to familiarize the maintenance procedure for various components of an automobile**.**

COURSE OUTCOMES:

After completing this course, the students can:

CO1: Inspect and diagnose the problems occurring in the various components of the vehicle.

Particulars	Hours
Unit 1: Inspection Schedule And Maintenance of Records	
Need for maintenance, types of maintenance: preventive and breakdown maintenance, requirements of maintenance, preparation of check lists. Inspection schedule, maintenance of records, log sheets and other forms, safety precautions in maintenance: General safety, tool safety.	4
Unit 2: Vehicle Maintenance Tools And Equipments	
Figs and Specifications of standard tools; non Standard tools; denting tools; painting equipment; testing equipment; Service station equipment; Hydraulic lift; Tyre changer; Tyre inflation gauge; Car Washer; Air Compressor; Spark Plug Cleaner and Tester; brake and transmission bleeding equipment; Grease Guns; Hydraulic Hoist; Analyzers: CO; HC; NOx; smoke meter: Engine analyzer: Petrol and Diesel; Ignition timing light; Wheel Balancer; Wheel aligner; Headlight aligner; Cylinder boring and honing; crankshaft grinder; Brake lathe m/c; ridge cutter and boring m/c; Trolley Jacks; Engine lifting cranes	8
Unit 3: Engine Tuning	
Procedure for carburetor based S.I Engine tuning; use of compression gauge; vacuum gauge; engine analyzer; exhaust analyzer; battery tester S.G tester; adjustment of spark plugs electrodes; Cam-dwell angle; valve tappet clearance; CB point; carburetor cleaning; air filter cleaning; replacement of engine oil and filter; ignition timing setting by timing light; tightening head bolts. Tyre inflation pressure; checking fuel consumption; MPFI and CRDI Engines: Study of tools needed to service the system: assembly line diagnostic link (ALDL) connector; ALDL read out scan tool; test light; ohmmeter; digital volt meter; jumper wires; vacuum gauge; Tachometer; computerized automotive maintenance system. Knowledge of diagnostic codes; service engine soon (SES) light; ECM; CALPAK. Study of important components : name; location and functions : TPS; IAC valve; ECM; MAP sensor; engine coolant temp sensor; IAT sensor; VSS; camshaft and Crankshaft – position sensor; start signal; PSP switch; Oxygen sensor; Fuel Vapor Canister; Catalytic Converter; Particulate filter; Troubles and diagnosis MPFI engines.	12
Unit-4: Engine Maintenance	
Tools used for engine disassembly, dismantling of engine components: cylinder head, valve train, cylinder block, connecting rod, piston and crankshaft assembly; cleaning and inspection of engine components, reconditioning of components. Cooling system: water pump, radiator, thermostat. Lubrication system maintenance, Anticorrosion and anti-freeze additives	10
Unit- 5: Chassis Maintenance	
Servicing and maintenance of clutch, gear box, universal joints, propeller shaft, differential system. Service and maintenance of brake – disc and drum brakes, steering wheel and suspension systems, wheel alignment, vehicle body maintenance	6

List of Experiments

1. Study of Automobile Repair Shop with the help of Layout.
2. Study and Preparation of Workshop Statements.
3. Experimental Study about Tools and instruments used in the maintenance shop.
4. Experiment to perform tuning of automobile multi cylinder engine.
5. Study and diagnosis of ignition, starting and charging system.
6. Study and diagnosis of Automobile fuel systems, filters & air cleaners
7. Wheel Balancing and adjustment of head light
8. Adjustment of pedal play in clutch brake, hand brake and steering wheel and Braking system troubleshooting.

Text Books

4. Shrivastava, Sushil Kumar., "Industrial Maintenance Management", S Chand & Company Ltd., 2005
5. Knott and Phil Knott, "An Introductory Guide to Motor Vehicle Maintenance: Light Vehicles", EMS publishing, 2010

Reference Books

6. Kholi.P.L. "Automotive Chassis and Body", Tata McGraw-Hill Co., Ltd., New Delhi, 1975.
7. Tim Giles, "Automotive service: Inspection, maintenance and repair", 3rd edition, 2007
8. Service manuals of various OEMs

Department of Mechanical Engineering
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Batch: 2016-20

ADVANCE AUTOMOBILE Engineering SEMESTER - VI	
Subject Code	**LD5210**
Marks	100
Number of Lecture Hours/Week	3
Total Number of Lecture Hours	6 x 13=78
CREDITS	4.5 (3-1-2)
COURSE OBJECTIVE:	
Aim of this course is to make students know and understand, constructional details, operating characteristics, vehicle homologation & safety design aspects.	
COURSE OUTCOME	
CO1: At end of course student will be aware of vehicle sub system basics and current Indian vehicle scenario of two, three and four wheelers.	
Particulars	Hours
Unit 1: VEHICLE CLASSIFICATION	
Categorization and Homologation of vehicles. Classification & Constructional details of two, three and four wheeled vehicles. Introduction to Off High way and Trailed vehicles. Racing and Sports cars. Passenger car Regulations, driver's visibility, space in cars. Seat location, Ergonomy, and safety measures. Car body construction; design criteria, crash tests on full scale model, Dummies and Instrumentation.	10
Unit 2: POWER PLANT	
Selection of engine for two wheeler, three wheeler & four wheeled vehicles. Constructional & working details of two & four stoke petrol & diesel engines. Engine performance, Testing and evaluation. Power and torque curve. Tractive effort, Acceleration and Gradability for a typical vehicle.	7
Unit 3: SUB SYSTEMS I – *BASIC INTRODUCTION*	
Fuel Supply System: Diesel & Petrol vehicle system such as Fuel Injection Pump, Injector & Fuel Pump, Carburetor, MPFI., CRDI **Electrical System :** Starting motor, generator & regulators, Ignition system, Magneto and battery coil ignition system, electronic ignition system , Kick starter system. lighting system Horn, Battery . **Cooling & Lubrication System:** Different types of cooling system and lubrication system	10
Unit-4: SUB SYSTEMS II – *BASIC INTRODUCTION*	
Chassis & Controls Mainframe and its types, gear controls- remote and direct, Clutch Brake and throttle controls, Controls on handle bar Panel / dashboard meters . **Exhaust systems** , Mufflers, silencers, Emission, Norms and Catalytic Control **Automobile Air Conditioning:** Requirements, Cooling & heating system	10
Unit- 5: CASE STUDY INDIAN TWO , THREE & FOUR WHEELERS / TETING	
Case study on features of Typical Indian model s of PC, LCV & HCV	3
TEXT BOOKS	
4. Automobile Engineering - Kripal Singh. 5. Automotive Chassis & Body by P.L. Kohli, TMH, New Delhi 6. Automotive Technology by Sethi, TMH, New Delhi	

REFERENCES

3. Motor Vehicles by Newton Steeds and Garrot, Butterworths, London – 2000.
4. Mechanism of the Car by Judge A.W, Chapman and Halls Ltd., London –1986
5. Automotive Chassis and Body by Crouse W.H, McGraw –Hill, New York –1971.
6. Automobile Engg. by K.K. Jain, R.B. Asthana, TMH –2002.
7. Automotive Engineering- Hietner
8. Motor Cycle Engineering by Irving P.E., Temple Press Book, London – 1992.

List of Experiments:

10. Basic Road performance test of a Three Wheeler
11. Basic Brake and Steering parameter measurement of a 4 Wheeler
12. Performance test of a shock absorber.
13. Two wheeler chain tension test.
14. Three & four wheeler brake and clutch play adjustment as per specification.
15. Assembly and Dismantling of SI cylinder head and study combustion chamber configuration
16. Assembly and Dismantling of CI cylinder head and study combustion chamber configuration
17. Dismantling and assembling of two / three wheeler gear box and finding gear ratios.
18. Dismantling and assembling of two / three wheeler handle bar steering system study of linkage & suspension mechanism
19. Study and layout of different three wheeler chassis frames and power transmission system.
20. Study and layout of typical Indian Tractor power train system.

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ALTERNATE FUELS AND ENERGY 2018
SEMESTER - VI

Subject Code	**LD6020**
Marks	100
Number of Lab Hours / Week	0
Total Number of Contact Hours / Sem	3x13=39
CREDITS	3 (LT P 3 0 0)

COURSE OBJECTIVES:
To make student understand & analyze Alternative Fuels for Engine.

COURSE OUTCOMES:
After completing this course, the students can:

CO1: Understand the various alternative fuels available.
CO2: Determine alternative fuels properties, performance characteristics, combustion characteristics, emission characteristics.
CO3: Determine Engine Modification required for alternative fuels.
CO4: Determine Electric, Hybrid and fuel cell technologies

Particulars	Hours
Unit 1: Introduction:	
Need for alternate fuel, availability and properties of alternate fuels, general use of alcohols, LPG, hydrogen, ammonia, CNG and LNG, vegetable oils and biogas, merits and demerits of various alternate fuels, introduction to alternate energy sources. Like EV, hybrid, fuel cell and solar cars.	5
Unit 2: Alcohols:	
Properties as engine fuel, alcohols and gasoline blends, performance in SI engine, methanol and gasoline blends, combustion characteristics in CI engines, emission characteristics, DME, DEE properties performance analysis, performance in SI & CI Engines	9
Unit 3: Natural Gas, LPG, Hydrogen And Biogas:	
Availability of CNG, properties, modification required to use in engines, performance and emission characteristics of CNG using LPG in SI & CI engines, performance and emission of LPG. Hydrogen; storage and handling, performance and safety aspects.	7
Unit-4: Vegetable Oils:	
Various vegetable oils for engines, esterification, performance in engines, performance and emission characteristics, bio diesel and its characteristics	14
Unit- 5: Electric, Hybrid, Fuel Cell And Solar Cars:	
Layout of an electric vehicle, advantage and limitations, specifications, system components, electronic control system, high energy and power density batteries, hybrid vehicle, fuel cell vehicles, solar powered vehicles.	5

Text Books

9. Richard.L.Bechfold – Alternative Fuels Guide Book - SAE International Warrendale- 1997.
10. Maheswar Dayal - "Energy today & tomorrow"- I & B Horishr India - 1982.
11. G.D. Rai "Non-conventional sources of energy Khanna Lab.

Reference Books

1. "Alcohols as motor fuels progress in technology" - Series No.19 - SAE PublicationUSE - 1980.
2. SAE paper nos. 840367, 841333, 841334, 841156, Transactions, SAE, USA.
3. William Hamilton 'Electric Automobiles', PHI

Department of Mechanical Engineering
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AUTOMOTIVE DESIGN USING CAD SOFTWARE
SEMESTER - VI

Subject Code	**LD6120**
Marks	100
Number of Lab Hours / Week	3
Total number contact hours	36
CREDITS	1.5 (L T P : 0 0 3)

COURSE OBJECTIVES:

The subject aims at imparting knowledge and skill components in the field of modeling, assembly, and applications of the automotive parts using the 3D CAD software – CREO parametric 4.0.

COURSE OUTCOMES
After completion of the course, the student will:

CO1: Acquire knowledge and use CAD software – CREO 4.0
CO2: Part model all the basic engineering components
CO3: able to perform assembly of different components
CO4: able to observe the mechanism if exist in the assembly of the components.
CO5: able to perform FEA analysis.

LIST OF EXPERIMENTS	Hours
EXPERIMENT 1:	
Introduction to CAD - Features of CREO**,** Basic steps in creating sketch, Sketcher Interface, Line, Centerline, Rectangle **Part Modeling:** Part mode, setting units, Extrude Module 1: To make a part model of a housing fixture using CREO 4.0. Write all the steps involved.	3
EXPERIMENT 2:	
Drafting: General view, projection view, sections, annotations Module 2: To perform drawing and drafting of a housing fixture using CREO 4.0. Write all the steps involved.	3
EXPERIMENT 3:	
Part Modeling: Revolve, Helical Sweep Module 3: Part modeling of the 1/2’ hexagonal bolts and also performs its drawing and drafting using CREO 4.0. Write all the steps involved.	3
EXPERIMENT 4:	
Part Modeling: Hole, Chamfer, Round Module 4: Part modeling of the Piston Head and also performs its drawing and drafting using CREO 4.0. Write all the steps involved.	3
EXPERIMENT 5:	
Part Modeling: Advance Extrude Module 5: Part modeling of the Camshaft and also performs its drawing and drafting using CREO 4.0. Write all the steps involved.	3
EXPERIMENT 6:	

Advance sketching: pallete, constraints, mirror Module 6: Part modeling of the Connecting Rod and also performs its drawing and drafting using CREO 4.0. Write all the steps involved.	3
EXPERIMENT 7:	
Part Modeling: Rib, Pattern Module 7: Part modeling of the Flywheels and also performs its drawing and drafting using CREO 4.0. Write all the steps involved.	3
EXPERIMENT 8:	
Part Modeling: user defined functions and dimensions Module 8: Part modeling of the Spur gear and also performs its drawing and drafting using CREO 4.0. Write all the steps involved.	3
EXPERIMENT 9:	
Assembly Modeling: Applying Standard Mates, automatic constraints, dragger Module 9: Part modeling of the Shaft and key for the Flywheels in module 7 and also complete an assembly of all the parts using CREO 4.0. Write all the steps involved.	3
EXPERIMENT 10:	
Mechanism: Belt mechanism, servomotor Module 10: Part of the modeling of the following parts: a. Shaft A b. Shaft B c. Pulley A d. Pulley B Complete the assembly. Apply and successfully run the belt mechanism between two pulleys. Write all the steps.	3
EXPERIMENT 11:	
Mechanism: Gear mechanism Module 11: Part of the modeling of the following parts: a. Shaft A b. Shaft B c. Spur Gear A from module 8 d. Spur Gear B from module 8 and change dimension as per shaft B. Complete the assembly. Apply and successfully run the gear mechanism. Write all the steps.	3
EXPERIMENT 12:	
Bending stress Analysis: FEA modeling, meshing, deflection Module 12: To perform FEA analysis of connecting rod of module 6. Write all the steps	3

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Course Title: **Computer Integrated Manufacturing**	Course Code: **LA7210**
Credit: 4	L **3** T **0** P **2**
Year: **4th**	Semester: **VII**

UNIT – I **8L**

Introduction- Concepts of CIM, Manufacturing system, components of CIM, CASA/SME model of CIM, CIM II, Benefits of CIM, Communication matrix in CIM, Fundamentals of computer communication in CIM, computer networking in CIM- seven layers of OSI model.

UNIT – II **8L**

NC & CNC part programming: Fundamental of NC technology, computer numerical control, distributed numerical control, coding systems and formats**,** Manual NC part programming, Examples drilling and milling, turning, CNC machines and turning centers, CNC part programming.

UNIT – III **8L**

Material Handling System -introduction to material handling, material transport equipment like industrial trucks, automated guided vehicles, monorail and other rail guided vehicles, conveyors, cranes and hoists.AS/RS design process

Identification technologies- introduction, bar code technology, radio frequency identification.

UNIT – IV **7L**

Flexible manufacturing systems: introduction, FMS components, equipments, FMS tool management systems, system layout, FMS control, case study. FMS applications and benefits.

Group technology and cellular Manufacturing: part families, part classification and coding Production flow analysis, application of Group technology.

UNIT – V **8L**

Process planning and Concurrent Engineering- process planning, computer aided process planning, concurrent engineering and design for manufacturing, advance manufacturing planning,

Production Planning and Control systems- Aggregate production planning and the Master Production schedule, Material Requirement planning, Shop floor control, Inventory control,
JUST IN TIME, Lean and Agile manufacturing

References Books:

1. Groover. Mikell P, "Automation, Production systems and computer integrated manufacturing", Third edition, PHI learning private limited, ISBN-978-81-203-3418-2.
2. Rao P N ,"CAD/CAM Principles and Applications "third edition, McGraw Hill Education Pvt.Ltd.ISBN-978-0-07-068193-4
3. Groover .Mikell P and Zimmers jr. Emory, "CAD/CAM", Prentice hall of India Pvt Ltd., 1998.
4. James A, Regh and Henry W. Kreabber "Computer integrated manufacturing" Pearson Education 2nded, 2005.
5. Paul G. Ranky., " Computer Integrated Manufacturing", Prentice hall of India Pvt Ltd., 2005

List of Experiments

1. Study of Flexible manufacturing system
2. Writing a part-programming (in word address format or in APT) for a job for drilling operation (point-to-point) and running on NC machine.
3. Writing a part programming (in word address format or in APT) for a job for milling operation (contouring) and running on NC machine
4. Experiment on Robots and it programs
5. Experiment on Transfer line/Material handling.
6. Experiment on difference between ordinary machine and NC machine
7. Study of retrofitting.
8. Experiment on study of system devices such as motors and feedback devices.
9. Experiment on Mechatronics & controls

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Course Title: **Total Quality Management**	Course Code: **LA7010**
Credit: 3	L **3** T **0** P **0**
Year: **4th**	Semester: **VII**

UNIT – I **8L**

Introduction, Need for quality, Evolution of quality, Definition of quality, Dimensions of manufacturing and service quality, Basic concepts of TQM, Definition of TQM, TQM Framework, Contributions of Deming, Juran and Crosby, Barriers to TQM.

UNIT – II **8L**

Process Control & Product Control, Concept of control charts, variables & attributes control chart for variables & attributes Acceptance Sampling and Sample Plans

UNIT – III **8L**

Concept of reliability, maintainability and availability. Bath tub curve, MTTF, MTTR, Zero Defect

UNIT – IV **8L**

The seven traditional tools of quality, New management tools, Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT, Bench marking. Reason to bench mark, Bench marking process, FMEA, Stages, Types. Deming Cycle, 5S Techniques, Kaizen

UNIT – V **8L**

Quality circles, Quality Function Deployment (QFD), Taguchi quality loss function, TPM – Concepts, Concept of Cost of Quality

Text Book:

1. Dale H. Besterfiled, et at., "Total Quality Management", Pearson Education Asia, Third Edition, Indian Reprint (2006).

Reference Books:

1. Quality Management by Kanishka Bedi – Oxford University press First Edition 2008
2. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 6th Edition, South-Western (Thomson Learning), 2005.
3. Oakland, J.S. "TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, 3rd Edition, 2003.
4. Suganthi, L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
5. Janakiraman, B and Gopal, R.K, "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.
6. Total Quality Management by Shri Dhara Bhatt K.

Department of Mechanical Engineering
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SPECIAL VEHICLES & EQUIPMENTS
SEMESTER – VII

Subject Code	LD7010
Marks	100
Number of Lecture Hours / Week	3
Total Number of Contact Hours / Semester	6x13=78
CREDITS	4.5 (3-1-2)

COURSE OBJECTIVES:

To provide the basic knowledge about the constructional and working of Tractors, Earth Moving Machines, Special Vehicles & Equipments.

Particulars	Hours
Unit 1: Tractors	
Development of tractors – prominent makes in India –Classification of tractors – main components-safety rules –Engine frame work – cooling system lubrication system – Fuel system – Salient features of tractor chassis, clutch, power transmission, final drive, steering, brakes & wheels.	4
Unit 2: Farm Equipment	
Tractor controls – Power take off, draw bar working – working of hydraulic system Working attachment of tractors, 3-Point Linkage – farm equipment- classification – auxiliary equipment - trailers & body tipping mechanism.	10
Unit 3: Off Road & Land Clearing Vehicles	
Classification & requirement – Power plants – chassis – transmission – multi axle vehicles. Land Clearing Machines Bush cutter, stumpers, Tree dozer, Rippers.	8
Unit-4: Earth Moving Machines	
Bulldozers, cable and hydraulic dozers. Crawler track, running and steering gears, scrapers, drag and sell powered types–Dump tracks and dumpers – Loaders, single bucket, multi bucket and rotary types- Power and capacity of earth moving machines. Scrapers, elevating graders, self-powered scrapers and grader	4

TEXT BOOKS

1. Road making Machinery by Abrosimov. K. Bran berg. A and Katayer. K., MIR Publishers, 1971.
2. Theory of Ground vehicles by Wang. J.T., John Wiley & Sons, New York, 1987.
3. Off the road Wheeled and combined traction devices Ashgate Publishing Co. Ltd. 1988.
4. Tractor and Automobiles by Rodichev and G. Rodicheva, MIR Publishers, 1987.
5. Design of Automotive engines for tractor by Kolchin A and V. Demidov, MIR Publishers, 1972

Department of Mechanical Engineering
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Batch: 2016-20

AUTO POLLUTION & CONTROL SEMESTER – VII	
Subject Code	LD7210
Marks	100
Number of Lecture Hours / Week	3
Total Number of Contact Hours / Semester	6x13=78
CREDITS	3 (3-0-0)

COURSE OBJECTIVES:

To make the students to realize the impact of automobile emissions on the environment and expose student to factors affecting formation and control of automobile pollutants and governing regulations

Particulars	Hours
Unit 1: INTRODUCTION	
Vehicle population assessment in metropolitan cities and contribution to pollution, effects on human health and environment, global warming, types of emission, transient operational effects on pollution, noise vibration and harshness (NVH).	4
Unit 2: POLLUTANT FORMATION IN ENGINES	
Pollutant formation in Engines, mechanism of HC and CO formation in four stroke and two stroke engines, NOx formation in engines, smoke and particulate emissions in CI engines, effects of design and operating variables on emission formation, control of evaporative emission. Two stroke engine pollution.	10
Unit 3: CONTROL OF EMISSIONS FROM ENGINES	
Design strategies to control emission from engines, optimum selection of operating variables for control of emissions, EGR, Thermal reactors, secondary air injection, catalytic converters, catalysts, fuel modifications, fuel cells, Two stroke engine pollution control.	8
Unit-4: NOISE POLLUTION FROM AUTOMOBILES	
Noise, Vibration And Harshness, Sources of Noise, Measurement of Noise –Engine Combustion Noise, Inlet And Exhaust Noise, Traffic Noise, Vehicle Body Noise – control of noise, control devices and noise proof materials.	4
UNIT-5: MEASUREMENT TECHNIQUES, EMISSION STANDARDS AND TEST PROCEDURE	
NDIR, FID, Chemiluminescent analyzers, Gas Chromatograph, smoke meters, emission standards, driving cycles – USA, Japan, Euro and India. Test procedures – ECE, FTP Tests. SHED Test – chassis dynamometers, dilution tunnels – 3 Field Visits	

TEXT BOOKS

1. Paul Degobert – Automobiles and Pollution – SAE International ISBN-1-56091-563- 1991.
2. Ganesan, V- "Internal Combustion Engines"- Tata McGraw-Hill Co.- 2003.
3. Beranek.L.L. " Noise Reduction", McGraw Hill Book co., Inc, New York, 1993.Tractor and Automobiles by Rodichev and G. Rodicheva, MIR Publishers, 1987.
4. SAE Transactions- "Vehicle Emission"- 1982 (3 volumes).
5. Obert.E.F.- "Internal Combustion Engines"- 1988
6. Marco Nute- " Emissions from two stroke engines, SAE Publication – 1998

Department of Mechanical Engineering
Course Structure for B.Tech. (ME-AE)
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EMERGING AUTOMOTIVE TECHNILOGIES SEMESTER – VII		
Subject Code	LD7610	
Marks	100	
Number of Lecture Hours / Week	3	
Total Number of Contact Hours / Semester	3x13=39	
CREDITS	3 (3-0-0)	
Particulars		Hours
Unit 1: The Future of The Automotive Industry		
Challenges and Concepts for the 21st century. Crucial issues facing the industry and approaches to meet these challenges. Fuel Cell Technology for Vehicles: What is fuel cell, Type of fuel cell, Advantages of fuel cell. Current state of the technology. Potential and challenges. Advantages and disadvantages of hydrogen fuel.		6
Unit 2: Latest Engine Technology Features		
Advances in diesel engine technology. Direct fuel injection Gasoline engine. Diesel particulate emission control. Throttling by wire. Variable Valve Timing, Method used to effect variable Valve Timing. Electromagnetic Valves, Camless engine actuation		10
Unit 3: Vehicles Systems		
Constantly Variable Transmission, Benefits, Semi-active and fully-active suspension system. Advantages of fully active suspension system. Use of Automotive micro controllers. Types of censors. Use of actuators in an automobile environment. X-By Wire Technology: What is X-By Wire, Advantage over hydraulic systems. Brake by wire, advantages over power Braking System. Electrical assist steering, Steering by wire, Advantages of Steering by wire.		8
Unit-4: 42 Volt System		
Need, benefits, potentials and challenges. Technology Implications for the Automotive Industry. Technological evolution that will occur as a result of the adoption of 42-volt systems. Integrated Starter Alternator: Start stop operation, Power Assist, Regenerative Braking. Advanced lead acid batteries, Alkaline batteries, Lithium batteries, Development of new energy storage systems, Deep discharge and rapid charging ultra-capacitors.		10
Unit-5: Electrical And Hybrid Vehicles		
Types of hybrid systems, Objective and Advantages of hybrid systems. Current status, Future developments and Prospects of Hybrid Vehicles		6

TEXT BOOKS

1. Advanced Vehicle Technologies by Heinz Heisler-SAE International Publication.
2. Electric and Hybrid Electric vehicles by Ronald K. Jurgen- SAE International Publication
3. Electronic Braking, Traction and Stability control-SAE Hardbound papers.
4. Electronics steering and suspension systems- SAE Hardbound papers.
5. 42 Volt system by Daniel J. Holt- SAE International Publication
6. Diesel Particulate Emission by J.H. Johnson- SAE Hardbound papers.
7. Fuel Cell Technologies for vehicles by Richard Stobart- SAE Hardbound papers

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ADVANCES IN I.C. ENGINES
SEMESTER – VII

Subject Code	LD7620
Marks	100
Number of Lecture Hours / Week	3
Total Number of Contact Hours / Semester	3x13=39
CREDITS	3 (3-0-0)

COURSE OBJECTIVES:
To provide the basic knowledge about

COURSE OUTCOMES:
After completing this course, the students can:

CO1: Understand the underlying principles of operation of different IC Engines and components.
CO2: Provide knowledge on pollutant formation, control, alternate fuel etc.
CO3: Compare the operations of different IC Engine and components and can evaluate the pollutant formation, control, alternate fuel

Particulars	Hours
Unit 1: SPARK IGNITION ENGINES	
Mixture requirements – Fuel injection systems – Monopoint, Multipoint & Direct injection - Stages of combustion – Normal and Abnormal combustion – Knock - Factors affecting knock – Combustion chambers.	6
Unit 2: COMPRESSION IGNITION ENGINES	
Diesel Fuel Injection Systems - Stages of combustion – Knocking – Factors affecting knock – Direct and Indirect injection systems – Combustion chambers – Fuel Spray behaviour – Spray structure and spray penetration – Air motion - Introduction to Turbocharging.	10
Unit 3: POLLUTANT FORMATION AND CONTROL	
Pollutant – Sources – Formation of Carbon Monoxide, Unburnt hydrocarbon, Oxides of Nitrogen, Smoke and Particulate matter – Methods of controlling Emissions – Catalytic converters, Selective Catalytic Reduction and Particulate Traps – Methods of measurement – Emission norms and Driving cycles.	8
Unit-4: ALTERNATIVE FUELS	
Alcohol, Hydrogen, Compressed Natural Gas, Liquefied Petroleum Gas and Bio Diesel - Properties, Suitability, Merits and Demerits - Engine Modifications	10
Unit-5: RECENT TRENDS	
Air assisted Combustion, Homogeneous charge compression ignition engines – Variable Geometry turbochargers – Common Rail Direct Injection Systems - Hybrid Electric Vehicles – NOx Adsorbers - Onboard Diagnostics.	6

TEXT BOOKS

1. Advanced Ramalingam. K.K., "Internal Combustion Engine Fundamentals", Scitech Publications, 2002.
2. Ganesan, "Internal Combustion Engines", II Edition, TMH, 2002
3. Mathur. R.B. and R.P. Sharma, "Internal Combustion Engines"., Dhanpat Rai & Sons 2007.
4. Duffy Smith, "Auto Fuel Systems", The Good Heart Willcox Company, Inc., 1987.
5. Eric Chowenitz, "Automobile Electronics", SAE Publications, 1995

Department of Mechanical Engineering
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Batch: 2016-20

QUALITY CONTROL & RELIABILITY ENGINEERING
SEMESTER – VIII

Subject Code	LD8610
Marks	100
Number of Lecture Hours / Week	3
Total Number of Contact Hours / Semester	3x13=39
CREDITS	3.5 (3-1-0)

COURSE OBJECTIVES:

To introduce the concept of SQC. To understand process control and acceptance sampling procedure and their application. To learn the concept of reliability.

COURSE OUTCOMES:

After completing this course, the students can:

CO1: Apply the concept of SQC in process control for reliable component production

Particulars	Hours
Unit 1: INTRODUCTION AND PROCESS CONTROL FOR VARIABLES	
Introduction, definition of quality, basic concept of quality, definition of SQC, benefits and limitation of SQC, Quality assurance, Quality control: Quality cost-Variation in process causes of variation – Theory of control chart- uses of control chart – Control chart for variables – X chart, R chart and □chart -process capability – process capability studies and simple problems. Six sigma concepts	10
Unit 2: PROCESS CONTROL FOR ATTRIBUTES	
Control chart for attributes –control chart for non-conforming– p chart and np chart – control chart for nonconformities– C and U charts, State of control and process out of control identification in charts, pattern study	5
Unit 3: ACCEPTANCE SAMPLING	
Lot by lot sampling – types – probability of acceptance in single, double, multiple sampling techniques – O.C. curves – producer‟s Risk and consumer‟s Risk. AQL, LTPD, AOQL concepts-standard sampling plans for AQL and LTPD- uses of standard sampling plan	9
Unit-4: LIFE TESTING – RELIABILITY	
Life testing – Objective – failure data analysis, mean failure rate, mean time to failure, mean time between failure, hazard rate – Weibull model, system reliability, series, parallel and mixed configuration – simple problems. Maintainability and availability – simple problems. Acceptance sampling based on reliability test – O.C Curves	4
Unit-5: QUALITY AND RELIABLITY	
Reliability improvements – techniques- use of Pareto analysis – design for reliability – redundancy unit and standby redundancy – Optimization in reliability – Product design – Product analysis – Product development – Product life cycles	8

TEXT BOOKS

1. Douglas.C. Montgomery, " Introduction to Statistical quality control", 4th edition, John Wiley 2001.
2. Srinath. L.S., "Reliability Engineering", Affiliated East west press, 1991
3. Monohar Mahajan, "Statistical Quality Control", Dhanpat Rai & Sons, 2001.
4. Gupta. R.C, "Statistical Quality control", Khanna Publishers, 1997.
5. Besterfield D.H., "Quality Control", Prentice Hall, 1993.
6. Sharma S.C., "Inspection Quality Control and Reliability", Khanna Publishers, 1998

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VEHICLE BODY ENGINEERING
SEMESTER – VIII

Subject Code	LD8620
Marks	100
Number of Lecture Hours / Week	3
Total Number of Contact Hours / Semester	3x13=39
CREDITS	3.5 (3-1-0)

COURSE OBJECTIVES:

To provide the basic knowledge about construction techniques & various types of automotive bodies under the light of aerodynamics.

COURSE OUTCOMES:

After completing this course, the students can:

CO1: Be exposed the fundamentals in various automotive body construction techniques
CO2: Integrate the concepts of aerodynamics in body engineering for better style and low drag.
CO3: familiarizes the various types of bus body construction, seating layout, regulations and comfort.
CO4: Understands the various heavy vehicle bodies, driver's visibility and cabin design.

Particulars	Hours
Unit 1:	
Car Body Details: Types: Saloon, Convertibles, Limousine, Estate van, racing and sports car. Visibility: Regulations, driver's visibility, test for visibility, Methods of improving visibility and space in cars. Safety: Safety design, safety equipments for car. Car body construction.	4
Unit 2:	
Vehicle Aerodynamics: Objectives, Vehicle drag and types, various types of forces and moments, Effects of forces and moments, side wind effects on forces and moments, various body optimization techniques for minimum drag. Wind tunnel testing: Flow visualization techniques, scale model testing. Component balance to measure force sand moments.	10
Unit 3:	
Bus Body Details: Types, minibus, single decker, double decker, two level, split level and articulated bus. Bus Body Lay Out: Floor height, engine location, entrance and exit location, seating dimensions	8
Unit-4:	
Constructional details: Frame construction, Double skin construction-Types of metal section used-Regulations-Conventional and Integral type construction.	4
Unit-5:	
Commercial Vehicle Details: Types of body, Flat platform, drop side, fixed side, tipper body, tanker body. Light commercial vehicle body types, Dimensions of driver's seating relation to controls, driver's cabin design. Body Materials, Trim and Mechanisms: Steel sheet, timber, plastics, GRP, properties of materials-Corrosion anti-corrosion methods, scalation of paint and painting process, body trim items. Body mechanisms.	8

TEXT BOOKS

1. Powloski. J. Vehicle Body Engineering, Business Books Ltd.,1989.
2. Giles. J. C. Body construction and design, IIIiffe Books Butterworth& Co.,1971
3. John Fenton, Vehicle Body layout and analysis, Mechanical Engg. Publication Ltd., London,1982
4. Braithwaite. J. B, Vehicle Body building and drawing, Heinemann Educational Books Ltd.,London,1977

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PAINT & PAINT SHOP TECHNOLOGY SEMESTER – VIII	
Subject Code	LD8630
Marks	100
Number of Lecture Hours / Week	3
Total Number of Contact Hours / Semester	3x13=39
CREDITS	3.5 (3-1-0)

COURSE OBJECTIVES:

Student will be able to understand fundamental principles involved in surface protection, identify types of paint and coatings, understand importance of surface preparation & methods for achieving same. He will know properties of various paints, usage, storage handling, and mixing of paint

Particulars	Hours
UNIT 1: AUTOMOTIVE SURFACE FINISHING DEVELOPMENT	
History, evolution, Scope of industrial surface finishes, nature of surface finishing industry and purpose Fundamentals of corrosion. Factors influencing performance of coatings designed to meet end user expectations. Economic importance of surface finishing.	6
Unit 2: CHEMISTRY OF ATOMS AND MOLECULES & PAINT FORMULATION	
How chemistry relates to coating technology. Roles of polymers, pigments and solvents. Principles of coating formulation, paint manufacture & paint behavior. Coating powders properties of coating materials. Automotive primers, surfacers and anti-chip coatings. VOC legislation. Types of basecoats &use of clear coats in basecoat clear systems. Ascertaining suitability of coatings systems for automotive use. Future role for coating powders in automotive plants.	10
Unit 3: PRETREATMENT OF SUBSTRATES	
Pre-treatment and science of adhesion. Importance of surface preparation, including cleanliness, surface roughness, and chemical modification of the surface. Methods of mechanical cleaning and substrate preparation. Processes and benefits of conversion coatings, Phosphating and Chromating. Reasons for handling components for coating application with due care. Meaning and purpose of utilities and prime services in the Paint Shop. Importance of water. RO / De-ionised in paint shop Basic processes of coating application. Comparison processes ' electro' and ' auto' phoresis. Use of spray application devices. Understanding principles of electrostatic application.	8
Unit-4: COATING PARAMETERS	
Understand powder coating processes: Fluidised bed dipping Electrostatic spray application. Basic understanding of coating powder handling. Gun movers, reciprocators/manipulators and robots. Feeding liquid materials to application devices. operation of pumps. Paint circulation systems. Options for colour change. Importance of air movement in the coating application process. Operational facilities provided by spray booths and flash-off areas. Drying and curing, Types of ovens. Process of infrared curing.	10
Unit-5: PROCESS CONTROL IN SURFACE FINISHING	
Understand the factors that influence the performance of coatings designed to meet end user expectations. Current test methods for assessing the properties - colour, mechanical & performance properties of films related to longevity. Review health, safety and environmental guidance associated with the application of coatings. Adopt some simple techniques for troubleshooting, basic tests for various processes role of the trouble-shooting auditor, Troubleshooting lists.	6

TEXT BOOKS

1. Selected Chapters from: Principles of Surface Coating Technology – Dean H Parke, John Wiely
2. Selected Chapters from: Powder Coatings Technology - M William Ranney, Noyes Data
3. Selected Chapters from: Paint Technology Hand Book – Rodger Talbert

VIBRATION, NOISE & HARNESS CONTROL SEMESTER – VIII	
Subject Code	**LD8640**
Marks	100
Number of Lecture Hours / Week	3
Total Number of Contact Hours / Semester	3x13=39
CREDITS	3.5 (3-1-0)

COURSE OBJECTIVES:

To provide the basic knowledge and understanding about the decision phases and apply competitive & supply chain strategies and drivers of supply chain performance. Understand the factors influencing network design and influence of forecasting in a supply chain. Role of planning, inventory, IT and coordination in SC. Case Study Auto Company.

Particulars	Hours
Unit 1: BASIC PRINCIPLES OF ENVIRONMENTAL NOISE	
Definition, basic attributes of sound (wavelength, period, frequency velocity, speed, pressure, power and sound intensity), units (decibel, dB (A) and SPL), Wave analysis of structures and spaces.	6
Unit 2: ENVIRONMENTAL NOISE PROPAGATION	
Sources, distance from source, atmospheric absorption, wind, temperature, wind and temperature gradient, obstacles such as barriers and buildings, ground absorption, reflections, humidity. **Perception And Of Effects Of Noise:** Human ear & hearing damage, measures of hearing, loudness, phones, noise descriptors. WHO guidelines for community noise: speech masking, activity interference, noise and sleep, noise annoyance, environmental impact assessment.	10
Unit 3: NOISE MEASUREMENTS AND INSTRUMENTATION	
Noise measurement and control instrumentation, Leq and various noise metrics for road, railway, aircraft and industrial noises. Noise Level indicators, Noise severity criteria, Various types of acoustic testing chambers. Source identification, Sound Intensity Mapping **Measures and Standards for the Environmental and vehicular noise:** Current standards and regulations: ISO and other relevant standards, Calculation of Road Traffic Noise, Railway Noise, Aircraft noise prediction, Highways assessment - operation and construction.	8
Unit-4: NOISE CONTROL	
Importance of reverberations time. Design of absorption systems for required reverberation time. Noise isolation design. Noise absorber design. Acoustic Design of Buildings Common strategies for reducing environmental noise exposure. Case studies on Railway systems, automobiles, Traffic Noise, Aircraft Noise Introduction to active noise control	10
Unit-5: VIBRATION CONTROL STRATEGIES	
Review of Vibration control measures, design of a Vibration Absorbers, unconstrained and constrained layer damping treatment, add on dampers, and stiffeners. Design of Isolators in machine foundations, Balancing, Role of materials damping. Introduction to Active Vibration Control.	6

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SUPPLY CHAIN MANAGEMENT SEMESTER – VIII	
Subject Code	LD8650
Marks	100
Number of Lecture Hours / Week	3
Total Number of Contact Hours / Semester	3x13=39
CREDITS	3.5 (3-1-0)

COURSE OBJECTIVES:

To provide the basic knowledge and understanding about the decision phases and apply competitive & supply chain strategies and drivers of supply chain performance. Understand the factors influencing network design and influence of forecasting in a supply chain. Role of planning, inventory, IT and coordination in SC. Case Study Auto Company.

Particulars	Hours
Unit 1: SUPPLY CHAIN STRATEGY	
Strategic Framework: Introduction to Supply Chain Management, Decision phases in a supply chain, Process views of a supply chain: push/pull and cycle views, Achieving Strategic fit, Expanding strategic scope.	6
Unit 2: SUPPLY CHAIN DRIVERS	
Supply Chain Drivers and Metrics: Drivers of supply chain performance, Framework for structuring Drivers, Obstacles to achieving strategic fit.	10
Unit 3: DISTRIBUTION & NETWORK	
Designing Supply Chain Network: Factors influencing Distribution Network Design, Design options for a Distribution network, E-Business and Distribution network, Framework for Network Design Decisions, Models for Facility Location and Capacity Allocation.	8
Unit-4: FORECASTING	
Forecasting in SC: Role of forecasting in a supply chain, Components of a forecast and forecasting methods, Risk management in forecasting.	10
Unit-5: MAINTENANCE	
Aggregate Planning and Inventories in SC: Aggregate planning problem in SC, and Strategies, Planning Supply and Demand in a SC, Managing uncertainty in a SC: Safety Inventory. Coordination in SC: Modes of Transportation and their performance characteristics, Supply Chain IT framework, Coordination in a SC and Bullwhip Effect	6

TEXT BOOKS

1. Sunil Chopra and Peter Meindl, Supply Chain Management - Strategy, Planning and Operation, 4th Edition, Pearson Education Asia, 2010.
2. David Simchi-Levi, Philp Kamintry and Edith Simchy Levy, Designing and Managing the Supply Chain - Concepts Strategies and Case Studies, 2nd Edition, Tata-McGraw Hill, 2000.

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VEHICLE & TRANSPORT MANAGEMENT SEMESTER – VIII	
Subject Code	LD8660
Marks	100
Number of Lecture Hours / Week	3
Total Number of Contact Hours / Semester	3x13=39
CREDITS	3.5 (3-1-0)

COURSE OBJECTIVES:

After completion of this course the students will be aware of transport fleet management and the related activities for minimizing operational and maintenance cost.

Particulars	Hours
Unit 1: INTRODUCTION	
Personnel management; objectives and functions of personnel management, psychology, sociology and their relevance to organization, personality problems. Selection process: job description, employment tests, interviewing, introduction to training objectives, advantages, methods of training, training procedure, psychological tests.	6
Unit 2: TRANSPORT SYSTEMS	
Introduction to various transport systems. Advantages of motor transport. Principal function of administrative, traffic, secretarial and engineering divisions. chain of responsibility, forms of ownership by state, municipality, public body and private undertakings.	10
Unit 3: SCHEDULING AND FARE STRUCTURE	
Principal features of operating costs for transport vehicles with examples of estimating the costs. Fare structure and method of drawing up of a fare table. Various types of fare collecting methods. Basic factors of bus scheduling. Problems on bus scheduling.	8
Unit-4: MOTOR VEHICLE ACT	
Traffic signs, fitness certificate, registration requirements, permit insurance, constructional regulations, description of vehicle-tankers, tippers, delivery vans, recovery vans, Power wagons and fire fighting vehicles. Spread over, running time, test for competence to drive.	10
Unit-5: MAINTENANCE	
Importance of maintenance. Schedule and unscheduled maintenance. Scope of maintenance. Equipment downtime. Vehicle inspection. Reports. Log books. Lay out and requirements of maintenance shop. Preventive maintenance system in transport industry, tyre maintenance procedures. Causes for uneven tyre wear; remedies, maintenance procedure for better fuel economy Design of bus depot layout Standard tool set, torque wrenches, compression and vacuum gauges, engine analyzer and scanner, computerized wheel alignment and balancing, gauges for engine tune up and pollution measurement.	6

TEXT BOOKS

1. John Duke - Fleet Management – McGraw-Hill Co, USA -1984.
2. Kitchin.L.D., - Bus Operation - Illiffee and Sons Co., London, III edition – 1992
3. Government Motor Vehicle Act –Publication on latest act to be used as on date

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PROFESSIONAL ETHICS IN ENGINEERING
SEMESTER – VIII

Subject Code	LD8670
Marks	100
Number of Lecture Hours / Week	3
Total Number of Contact Hours / Semester	3x13=39
CREDITS	3.5 (3-1-0)

COURSE OBJECTIVES:

To introduce the concept of SQC. To understand process control and acceptance sampling procedure and their application. To learn the concept of reliability.

COURSE OUTCOMES:

After completing this course, the students can:

CO1: Apply the concept of SQC in process control for reliable component production

Particulars	Hours
Unit 1: HUMAN VALUES	
Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully –Caring – Sharing – Honesty – Courage – Valuing time – Cooperation– Commitment – Empathy – Self confidence – Character –Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.	10
Unit 2: ENGINEERING ETHICS	
Senses of 'Engineering Ethics' – Variety of moral issues –Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest –Customs and Religion – Uses of Ethical Theories.	9
Unit 3: ENGINEERING AS SOCIAL EXPERIMENTATION	
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law	4
Unit-4: SAFETY, RESPONSIBILITIES AND RIGHTS	
Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – Respect for Authority –Collective Bargaining – Confidentiality – Conflicts of Interest –Occupational Crime – Professional Rights – Employee Rights –Intellectual Property Rights (IPR) – Discriminati	9
Unit-5: GLOBAL ISSUES	
Multinational Corporations – Environmental Ethics –Computer Ethics – Weapons Development – Engineers as Managers– Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Code of Conduct – Corporate Social Responsibility.	8

TEXT BOOKS

1. Prof. K. Pandian, "Professional Ethics in Engineering", 4th edition, Air walk publication 2015.

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Course Title: **Mechatronics**	Course Code: **LA8600**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VIII**

UNIT – I **8L**

Mechatronics-A leading edge technology, Systems, measurement system, control system, microprocessor based controller, Response of systems, automation and Mechatronics application.

Signal conditioning- Wheatstone bridge, digital signal –Analog to digital convertor, digital to analog convertor, data acquisition

UNIT – II **8L**

Sensors and transducers – performance terminology, displacement, position and proximity, velocity and motion, force, fluid pressure, temperature, light sensors, selection of sensors.

Actuation system- Mechanical actuations, Pneumatics and Hydraulic actuations system, Electrical actuations systems.

UNIT – III **8L**

Microprocessor and microcontrollers- Concept, Microprocessor system, Architecture and instruction sets for 8085, 8051. Difference between Microprocessor and Microcontrollers.

Digital logic – number system, logic gates, Boolean algebra, karnaugh maps, flip flops, decoders, demultiplexers and multiplexers.

UNIT – IV **8L**

Programmable logic controllers (PLC)- introduction, basic structure of PLC, input and out modules, programming, ladder diagram for Timers, Internal relay and Counters, Shift registers , Master and Jumps controls, selection of PLC, ladder diagram for sequencing of two and three cylinders.

UNIT – V **8L**

Micro-electro mechanical system (MEMS)- introduction, Basic block diagram, material used in MEMS, Manufacturing methods for MEMS like Bulk micromachining, Surface-micro machining and Photolithographic, Application, Advantage.

Industrial Robots- Anatomy of Robots, Robot control system, Robot accuracy and repeatability, law of Robots, End effectors, industrial application, Robots in material handling.

Reference books:

1. Bolten, W.,"Mechatronics electronic control in mechanical and electrical engineering"; pearson education Ltd ISBN 978-81-7758-284-0.
2. Webb. J. W, R. A. Reis, "Programmable Logic Controller – Principles and Applications" 5/e, Prentice Hall of India Ltd. ISBN 81-203-2308-4.
3. Groover M. P.,"Industrial Robotics – Technology, Programming and Applications", McGraw Hill International Editions, Industrial Engineering Series, ISBN 0-0-100442-4.
4. Singh, M.D., & Joshi, J.C., " Mechatronics " PHI publication ISBN 81-203-2986-4

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Course Title: **Mechanical Vibrations**	Course Code: **LA8670**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VIII**

UNIT – I **10L**

INTRODUCTION:

Periodic motion, harmonic motion, superposition of simple harmonic motions, beats, Fourier analysis. Single Degree Freedom System: Free vibration, Natural frequency, Newton's method, Rayleigh method and Energy method fordetermining natural frequency, Response to an initial disturbance, Torsional vibrations, Damped vibrations. Damping models – Structural, Coulomb and Viscous damping, Vibrations of system with viscous damping, Logarithmic decrement, Viscous dampers

UNIT – II **10L**

Single Degree Freedom: Forced vibration, Sources of excitation, Harmonic Excitation with viscous damping, Steady state vibrations, Forced vibrations with rotating and reciprocating unbalance, Support excitation, Vibration Isolation and Transmissibility, Vibration measuring instruments- Displacement, Velocity, Acceleration and Frequency measuring instrument

UNIT – III **6L**

Two Degree of Freedom System: Introduction, Principal modes, Double pendulum, Torsional system with damping, Coupled System, Vibration absorbers, Centrifugal pendulum absorber, Dry friction damper, Untuned viscous damper

UNIT – IV **7L**

Multidegree of Freedom Systems: Exact Analysis, Undamped free and forced vibrations of multi degree system, Influence coefficients, Reciprocal Theorem, Torsional vibration of multi-rotor system, Principal coordinates, Numerical Analysis - Rayleigh's Mehod, Dunkerley's formula, Holzer's Method, Stodola's Methods and Rayleigh – Ritz method.

UNIT – V **7L**

Critical Speed of Shafts: Shafts with one disc with and without damping, Multi-disc shafts, Secondary Critical speed.

Continuous systems- Longitudinal vibration of bars, Torsional vibrations of Circular Shafts, Lateral vibration of beams.

Reference Books :

1. S.S. Rao, Mechanical Vibrations, 4th edition, Pearson,2014
2. Magreb, Cengage, Mechanical Vibration, India, New Delhi
3. Dr. Debabrata Nag,Mechanical Vibrations, 1st edition,2011
4. V. P. Singh, Mechanical Vibrations, 3rdedition, Dhanpat Rai & Co.,2011.

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MOTOR VEHICLE & ENVIRONMENT PROTECTION LAW SEMESTER – VIII	
Subject Code	LD8690
Marks	100
Number of Lecture Hours / Week	3
Total Number of Contact Hours / Semester	3x13=39
CREDITS	3.5 (3-1-0)

COURSE OBJECTIVES:

This course is designed to impart the fundamental notions of relevance of the MV Act and the regulatory framework for the same. Acquaints the students with the registration of motor vehicles and to the various liabilities arising out of wrongful use of motor vehicles

COURSE OUTCOMES:

After completing this course, the students can:

CO1: Discuss the need for regulation and explain the regulatory framework.
CO2: Describe the provisions of the Motor Vehicles Acts relating to registration of motor vehicles
CO3: Fix liabilities arising out of wrongful use of motor vehicles

Particulars	Hours
Unit 1: MOTOR VEHICLES	
Introduction, Necessity of licensing and regulation, Motor Vehicle Act, 1988 – objectives and framework, Licensing of drivers of motor vehicles, Licensing of conductors of stage carriages.	10
Unit 2: REGISTRATION OF MOTOR VEHICLES	
Necessity of registration, Procedure for registration, No-objection certificate, Age limit for motor vehicles, Control of transport vehicles, Provisions relating to state transport undertakings, Construction, equipment and maintenance of motor vehicles, Control of traffic, Motor vehicles temporarily leaving or visiting India	9
Unit 3: LIABILITY	
Liability to pay compensation, permanent disablement, insurance of motor vehicles, against third party risks, Motor Vehicles Claims Tribunal, offences and penalties under the Act	4
Unit-4: ENVIRONMENT PROTECTION	
The law relating to the preservation, conservation and protection of forests, wildlife and endangered species, marine life, coastal ecosystems and lakes etc. -Prevention of cruelty towards animals - The law relating to prevention and control of water pollution - Air Pollution - Environment pollution control mechanism – Law relating to environment protection – National Environmental Tribunal and National Environmental Appellate Authority.	9
Unit-5: INTERNATIONAL ENVIRONMENTAL REGIME	
International Environmental Regime - Transactional Pollution - State Liability -Customary International Law - Liability of Multinational Corporations/Companies -Stockholm Declaration on Human Environment, 1972 - The role of UNEP for the protection of environment - Ramsar Convention 1971 – Bonn Convention (Migratory Birds) 1992 - Nairobi Convention, 1982 (CFCC) – Biodiversity Convention (Earth Summit), 1992 - Kyoto Protocol 1997, Johannesburg Convention 2002.	8

TEXT BOOKS

1. Sengupta's Commentary on Motor Vechicles Act. 3rd ed. Allahabad, Dwivedi Law Agency, 2006.
2. Kannan, K., and N. Vijayaraghavan. MLJ Motor Vehicle Laws (2 Vols). 13th ed. New Delhi: LexisNexis Butterworths Wadhwa & Company Nagpur, 2008.
3. Ejaz Ahmad's An Exhautive Commentary on Motor Vehicles Act. 4th ed. Revised by Anil Sachdeva. Jodhpur: Unique Law Publishers, 2007.
4. Chetan Singh Mehta: Environmental Protection and Law
5. V.K. Krishna Iyer: Environment Pollution and Law

DIT UNIVERSITY
Dehradun

Course Structure & Detailed Syllabus

of

B. Tech. in Petroleum Engineering

Batch 2016-20

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Year: 1st **Semester: I**

Course Code	Course Title	L	T	P	Credit
JA1010	Engineering Mathematics-I	3	1	0	3.5
BA1210	Engineering Chemistry	3	1	2	4.5
EA1210	Introduction to Electrical Engineering	3	1	2	4.5
FA1210	Introduction to Electronics & Communication	3	1	2	4.5
HA1210	Professional Communication-I	3	1	0	3.5
DA1210	Computer Fundamental & C Programming	3	0	2	4
LA1110	Workshop Practice	0	0	2	1
	Total				**25.5**

Year: 1st **Semester: II**

Course Code	Course Title	L	T	P	Credit
JA2010	Engineering Mathematics-II	3	1	0	3.5
OA1210	Engineering Physics	3	1	2	4.5
LA1210	Essentials of Mechanical Engineering	3	1	2	4.5
HA2210	Professional Communication-II	3	0	1	3.5
DA2210	Computer Programming in C++	3	0	2	4
BA1010	Environmental Science	2	0	0	2
LA1220	Engineering Graphics	1	0	0	1
HA1310	Soft Skills Development	0	0	2	1
	Total				**24**

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Year: 2nd **Semester: III**

Course Code	Course Title	L	T	P	Credit
MA3210	Applied Geology - I	3	1	2	4.5
MA3010	Introduction to Petroleum Operation	3	1	0	3.5
JA3010	Engineering Mathematics-III	3	1	0	3.5
OA3010	Engineering Physics-II	3	1	0	3.5
LA3090	Essentials of Mechanical Engineering-II	3	1	0	3.5
CA3230	Basic Surveying	3	1	2	4.5
	Total				**23**

Year: 2nd **Semester: IV**

Course Code	Course Title	L	T	P	Credit
MA4210	Fluid Mechanics & Machinery	3	1	2	4.5
MA4220	Heat Transfer Process	3	1	2	4.5
MA4230	Drilling Fluid and Cements	3	1	2	4.5
MA4010	Applied Geology -II	3	1	0	3.5
MA4020	Chemical Thermodynamics	3	1	0	3.5
MA4030	Oil & Gas Well Drilling Technology and Well Completion	3	1	0	3.5
MA4310	Value Addition Training *	0	0	2	1
MA4410	Industrial Tour	0	0	2	1
	Total				**26**

* List of Courses for Value Addition

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Year: 3rd **Semester: V**

Course Code	Course Title	L	T	P	Credit
MA5210	Elements of Reservoir Engineering	3	1	2	4.5
MA5220	Unit Operation	3	1	2	4.5
MA5010	Petroleum Production Operation-I	3	1	0	3.5
MA5020	Petroleum Exploration Methods	3	1	0	3.5
GC5010	Engineering Economics	2	0	0	2
JA5210	Computer Based Numerical Techniques	3	1	2	4.5
MA5310	Aptitude Building -I	0	0	2	2
	Total				**24.5**

Year: 3rd **Semester: VI**

Course Code	Course Title	L	T	P	Credit
MA6010	Petroleum Production Operation-II	3	1	0	3.5
MA6020	Formation Evaluation	3	1	0	3.5
MA6030	Applied Petroleum Reservoir Engineering	3	1	0	3.5
MA6040	Petroleum Refining and Petrochemicals	3	1	0	3.5
MA6050	Oil and Gas Well Testing	3	1	0	3.5
HA5010	Principles of Management	2	0	0	2
MA6310	Aptitude Building -II	0	0	2	1
MA6110	Petroleum Product Testing Lab.	0	0	2	1
MA6120	Project Phase - I	0	0	4	1
	Total				**22.5**

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
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Year: 4th Semester: VII

Course Code	Course Title	L	T	P	Credit
MA7010	Petroleum Engineering System Design	3	1	0	3.5
MA7020	Reservoir Simulation	3	1	0	3.5
MA7030	Offshore Drilling and Production Practices	3	1	0	3.5
MA7040	Well Stimulation	3	1	0	3.5
	Departmental Elective-I	3	1	0	3.5
MA7110	Project Phase - II	0	0	4	2
MA7510	Industrial Training Presentation *	0	0	2	4
	Total				**23.5**

* During Summer Vacation after VIth semester students are compulsorily required to attend Industrial Training of 6-8 weeks which will be evaluated in VII Semester under Industrial Training Presentation (MA7510).

List of Departmental Elective-I for VII Semester:

MA7610	Non-Conventional Petroleum Resources
MA7620	Material Technology
MA7630	Polymer Technology
MA7640	Directional Drilling

Year: 4th Semester: VIII

Course Code	Course Title	L	T	P	Credit
	Open Elective	3	0	0	3
MA8010	Natural Gas Engineering	3	1	0	3.5
MA8020	Oil & Gas Transportation System	3	1	0	3.5
MA8030	Enhanced Oil Recovery	3	1	0	3.5
	Departmental Elective – II	3	1	0	3.5
MA8110	Project Phase -III	0	0	8	4
	Total				**21**

List of Departmental Elective-II for VIII Semester:

MA8610	Health, Safety and Environmental Management in Petroleum Operations
MA8620	Oil and Gas Marketing and Resource Management
MA8630	Fuel Technology
MA8640	Carbon Capture and Sequestration

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

List of Open Electives (To be conducted in VIII Semester)

Sl. No.	Branch	Subject Code	Name of Elective subjects
1	Physics	OA8710 OA8720	1. Nano Scale Science and Technology 2. Photonics Technology
2	EE	EA8710 EA8720	1. Non-Conventional Energy Resources 2. Instrumentation and Process control
3	ME	LA8710 LA8720	1. Entrepreneurship development 2. Quality Management
4	Civil	CA8710 CA8720	1. Environment and Ecology 2. GIS
5	CSE	**DA8740** DA8710	1. Management Information System (MIS) 2. Business Intelligence
6	IT	IA8730 IA8721	1. Internet of Things 2. IT In Business
7	ECE	FA8710	1. Consumer Electronics
8	Humanities	HA8710 HA8720	1. Industrial Psychology 2. Human Values and Ethics
9	MBA	GA8710 GA8730 GA8740	1. Organizational Behavior 2. Digital Marketing 3. Financial Modeling with Spread sheet

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Engineering Mathematics-I**	Course Code: **JA1010**
Credit: **3.5**	L **3** T **1** P **0**
Year: **1st**	Semester: **I**

UNIT I: Differential Calculus-I [**9**]

Functions of single variable: Limit continuity and differentiability; Indeterminate forms; Mean value theorems; Role's Theorem; Taylor's theorem with remainders; Curve tracing.

UNIT II: Differential Calculus-II [**9**]

Successive differentiation; Leibnitz theorem; Partial differentiation; Euler's theorem; Expansion of functions of several variables; Extrema of functions of several variables; Lagrange's method of multipliers.

UNIT III: Integral Calculus [**9**]

Improper integral-Beta and Gamma functions; Double and Triple integrals; change of order of integration; change of variables; Dirichlet's integral and its applications; Application of multiple integral.

UNIT IV: Vector Calculus [**12**]

Vector Differentiation: Scalar and vector fields; gradient of scalar point function; directional derivatives; divergence and curl of vector point function; solenoidal and irrotational vectors.

Vector Integration: line, surface and volume integrals; Green's theorem; Stokes' theorem and Gauss divergence theorem (without proof).

Text Books:

- R. K. Jain & S. R. K. Iyenger, **Advanced Engineering Mathematics**, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.

Reference Books:

- E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, John &Wiley Sons, U.K., 2006.
- B. S. Grewal, **Higher Engineering Mathematics**, 42th Edition, Khanna publication, New Delhi, India, 2012.

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Engineering Chemistry**	Course Code: **BA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **I**

UNIT – I

Water Chemistry

Introduction, Analysis of Water – Alkalinity, Chlorides and Dissolved Oxygen, Hardness of Water - Temporary and Permanent hardness, Estimation of hardness by EDTA Method, Disadvantages of Hard Water, Numerical problems.

Water for Industrial purpose – Boiler Feed Water, Boiler Troubles (Priming and Foaming, Boiler Corrosion, Scales and Sludges, Caustic Embrittlement), Water Treatment: Internal Treatment (Colloidal, Phosphate, Calgon, Carbonate Conditioning), External Treatment (Lime-Soda Process, Zeolite Process, Ion- Exchange Process), Numerical Problems.

UNIT – II

Physical Chemistry

Electrochemistry: Reference electrodes, Ion selective electrodes, Chemically modified electrodes as sensors, Electrochemical energy systems, Lithium batteries, Fuel cells.

Thermochemistry: Hess's Law, Heat of a reaction, Effect of temperature on heat of reaction at constant pressure (Kirchoff's eq.), Heat of dilution, Heat of hydration, Heat of neutralization and Heat of combustion.

Surface chemistry: Surface and interfacial tension, Capillary pressure.Adsorption phenonmenon, Adsorption of gaseson solids, Frendlich and Langmuir adsorption isotherms,Role of adsorbents in catalysis, ion-exchange and pollution abatement.

UNIT – III

Science of Corrosion and Protective Coatings

Introduction, Types of Corrosion, Theories of Corrosion and Mechanism, Factors Influencing Corrosion.Control of Corrosion.

Types of Protective Coatings: Metallic Coatings, Anodic Coatings, Galvanization, Cathodic Coatings, Tinning, Metal Cladding, Electroplating (Chromium Plating, Metal Spraying, Cementation-Sheradizing, Colourizing, Chromizing).

UNIT – IV

Introduction to Polymers and Nano-materials

Polymerization, Classification of polymers, Addition and Condensation Polymerizations. Plastics - Thermosetting and Thermoplastics. Preparation, Properties and Uses of Polyethylene, PVC, Teflon, Bakelite, Nylon, Polyester, Polyurethane, Ziegler-Natta catalyst, conducting polymers.Rubber-Processing of Natural Rubber, Vulcanization and Compounding. Elastomers: Buna-S, Buna- N, Thiokol.

Introduction to Nano-materials: Fullerenes, Nano-tubes, Nano-wires, Nano-cones, Nano-dots, Nano-sphere, Haeckelites. Their electronic and mechanical properties, Production methods for CNTs. Applications of nano materials in i) Medicine ii) Catalysis iii) Environmental Technologies iv) Electronics& related fields. v) Mechanics.

UNIT – V

Fuels & Lubricants

Fuels: Classification, crude oil: composition and fractionation, Octane & Cetane Number and their significance; calorific value of fuel, Determination of calorific value of fuels, bomb calorimeter, Solid fuels - Proximate and ultimate analysis, Numericals problems.

Lubricants: Functions of lubricants, Mechanism of Lubrication (thick film or hydrodynamic lubrication, thin film or boundary lubrication, extreme pressure lubrication), Classification and properties of lubricants-Viscosity, Flash and fire point, Cloud and pour point, Aniline point, Neutralization number and mechanical strength. Numerical problems on acid value and saponification value.

Text Books:

1. Chemistry in Engineering & Technology (Vol I & II) (Latest ed.) By J.C. Kuriacose& J. Rajaraman, Tata McGraw-Hill Co, New Delhi.
2. Engineering Chemistry by O.G. Palanna, Tata McGraw-Hill Co, New Delhi.

Reference Books:

1. Atkins' Physical Chemistry by Peter W. Atkins and Julio de Paula, Oxford University Press.
2. Principles of Physical Chemistry (Latest ed.) By Puri, Sharma & Pathania.
3. Organic chemistry, Morrison and Boyd, Pearson Prentice Hall, 2011
4. Environmental chemistry, S.E. Manahan, 9th edition, CRC Press.
5. Textbook of polymer science by F.W. Billmeyer, Wiley India.

Engineering Chemistry Lab

List of Experiments

1. Estimation of hardness of water by EDTA method
2. Estimation of total alkalinity in the given water sample.
3. Estimation of dissolved oxygen in the given water sample.
4. Estimation of available chlorine in the given sample of bleaching powder.
5. pH-metric titration.
6. Determination of viscosity of lubricants by Redwood viscometer / Ostwald's viscometer.
7. Determination Surface Tension of lubricants.
8. Determination of Flash point of a given oil by Pensky_Marten's flash point approach.
9. To Determine Saponification-value of the given Lubricating Oil.
10. To Determine Acid-Value of the given Lubricating Oil.
11. To determine the moisture, volatile and ash contents in a given coal sample by proximate analysis.
12. To study the adsorption of acetic acid on activated charcoal.

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Introduction to Electrical Engineering**	Course Code: **EA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **I**

UNIT – 1
D.C. NETWORK THEORY
Review of basic circuit theory concepts, Mesh and Nodal analysis, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Star–delta transformation, Magnetic Circuits.

UNIT – 2
A.C. CIRCUITS & MEASURING INSTRUMENTS
*Single Phase A.C.:*Phasor representation of voltage and current, A.C. circuit behavior of resistance, inductance, capacitance & their combination in series and parallel, Power triangle, Power factor, Concept of series & parallel resonance.
*Three Phase A.C.:*Star – delta connections, Relation between line and phase quantities, three phase power and its measurement, What is 3 phase 4 wire and 3 phase 5 wire system?
Measuring Instruments: Construction and principle of voltage and current measuring instruments.

UNIT – 3
TRANSFORMERS
Principle of operation, Types of construction, Phasor diagram, Equivalent circuit, Efficiency and voltage regulation of single phase transformer, O.C. and S.C. tests.

UNIT – 4
D.C. & SYNCHRONOUS MACHINES
D.C. Machines: Construction and working principle of d.c. generator and d.c. motor, Types of d.c. machines, E.M.F. equation, Torque equation, Magnetization and load characteristics, Losses and efficiency, Need of starter in d.c. motors.
Synchronous Machines: Construction and Principle of operation of Alternator and Synchronous Motor.

UNIT – 5
INDUCTION MOTORS
Three Phase Induction Motors: Principle of operation of 3-Ø induction motor, Types of 3-Ø induction motor, Need of starters in 3-Ø induction motors, Slip – torque characteristics,
Single Phase Induction Motor: Principle of operation of single phase induction motor, Methods of starting of single phase induction motor.

Reference Books:
1. V. Del Toro. " Principles of electrical Engineering, "Prentice hall International.
2. W.H. Hayt& J.E. Kemmerly," Engineering circuit Analysis, "McGraw Hill.
3. I. J. Nagrath, "Basic Electrical Engineering," Tata Mc. Graw Hill.
4. A. E. Fitgerald, D.E., Higginbotham and A Grabel, "Basic Electrical Engineering" McGraw Hill
5. H. Cotton, "Advanced Electrical Technology" Wheeler Publishing.

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20
Basic Electrical Engineering Lab

(Any Ten)

1. Verification of Network Theorems.
2. Study of diode characteristics. Study of phenomenon of resonance in RLC series circuit.
3. Measurement of power in a three phase circuit by two wattmeter method.
4. Measurement of efficiency of a single phase transformer by load test.
5. Determination of parameters and losses in a single phase transformer by OC and SC test.
6. Study of characteristic of DC Motor.
7. Study of characteristic of AC Motor.
8. DC generator characteristics.
9. 10. Speed control of dc shunt motor.
10. Study running and reversing of a three phase induction motor.
11. Study of a single phase energy meter.

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Introduction to Electronics & Communication**	Course Code: **FA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **I**

UNIT 1: Fundamental of Semiconductors ***10 L***

Energy bands in semiconductors, intrinsic and extrinsic semiconductors, Fermi Level in Intrinsic and Extrinsic semiconductor, Carrier transport in semiconductors: diffusion current, drift current, mobility, Hall Effect and resistivity. Generation and recombination of carriers.

UNIT 2: Application of Low Power and High Power Diodes ***10 L***

Diode circuits: Construction, Junction diode characteristics, Half and full wave rectifiers - Expression for efficiency and ripple factor - Bridge rectifier – π Filter circuits, Clipper, Clamper and multipliers using diodes, Zener Diode Characteristics - Regulated power supply using Zener diode.

UNIT 3: Transistor fundamentals ***8 L***

Transistor circuits: Characteristics of a transistor in CB, CE and CC modes - Relatively merits - Biasing of Transistors - Load Line and operating point concept (both AC and DC). Construction and working of JFET and MOSFET.

UNIT 4: Digital fundamentals and Introduction to Signals ***8 L***

Basic logic gates: AND, OR, and NOT – implementation of all gates using Universal gates, Number Systems conversions, Boolean algebra, K-map (upto 4 variables). Source of Information, Types of Signals.

UNIT 5: Basics of Communications & Instrumentation ***9 L***

*C*ommunication Systems, Communication Channels, Need of modulation, Types of modulations (Wave shapes and final expression only), Study of Piezoelectric, PMMC, LVDT and Strain Gauge transducers and their classifications and display device (7 segment) only.

Reference Books:

Unit 1. Electronics Devices and Circuits, Millman and Halkias, Tata McGraw Hill, 4th ed.
Unit 2 & 3. Electronic Devices and Circuit Theory, Robert L. Boylestad, Prentice Hall Higher Edu., 2000.
Unit 4. Digital Design, Morris Mano, PHI
Unit 4. Modern Digital & Analog Communications, B. P. Lathi, OUP
Unit 5. Electronic Communication Systems, John Kennedy , Tata McGraw Hill, 4th ed.
Unit 5. Electronic Instrumentation - H. S. Kalsi

ELECTRONICS ENGINEERING LAB.

1. To identify and Study of the various component and Devices of electronics with their specification (CRO, Function Generator, Multimeter, Power Supply, resistor, capacitor, inductor, ICs, LED, potentiometer etc.)
2. To study the V-I characteristics of PN diode and Zener diode.
3. To find the efficiency of Rectifiers and ripple factor of capacitive and non-capacitive half wave and full wave rectifier.
4. To Study and Verify clipper and clamper with biased circuits.
5. To find the characteristics of CB and CE amplifiers.
6. Determine the characteristics of FET.
7. To find out the power energy of various periodic and non periodic signals.
8. To verify the logic gates using diodes.
9. Study and observations of AM & FM Waveforms.
10. Study of various transducers (Strain Gauge).

***** *Plus 2-3 value added experiments can be performed.*

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Professional Communication – I**	Course Code: **HA1210**
Credit: **3.5**	L **3** T **1** P **0**
Year: **1st**	Semester: **I**

UNIT 1: **COMMUNICATION** **(6 Hrs)**

1. Communication: Definition and Process of Communication.
2. Types of Communication: Formal and Informal Communication, Verbal and Non-Verbal Communication.
3. Barriers to Communication: Intrapersonal and Interpersonal Barriers. Semantic Barriers, Physical Barriers, Psychological Barriers, and Organizational Barriers.

UNIT 2: **LISTENING SKILLS & SPEAKING SKILLS** **(8 Hrs)**

1. Importance and Objective of Listening Skills, Process of Listening, Listening and Hearing, Types of Listening, and Methods for Improving Listening Skills
2. Listening Comprehension: Identifying General and Specific Information.
3. Listening for Note taking and drawing Inferences.
4. Importance of Speaking Skills, Types of Speaking, Methods for Improving Speaking Skills
5. Introduction to Phonetic Transcription: Familiarization with British and American Usage.

UNIT 3: **READING SKILLS** **(4 Hrs)**

1. Importance of Reading Skills, Types of Reading Skills, Methods of Improving Reading Skills.
2. Vocabulary Building: Antonyms, Synonyms, Homophones, Homonyms, and One-Word Substitution, Etymology and roots.

UNIT 4: **WRITING SKILLS** **(10 Hrs)**

1. Importance of Writing Skills, Types of Writing Skills, and Methods for Improving Writing Skills.
2. Sentence and Paragraph Construction. Writing Expository, Argumentative and Deductive Order etc Paragraphs.
3. Précis Writing
4. Basic Letter Writing: Format and Style of Formal Letters.

UNIT 5: **ONE ACT PLAY** **(6 Hrs)**

Practice of LRSW through the study of the one act play, ***THE REFUND*** by **Fritz Karinthy**.

TEXT BOOK

1. Gupta, Ruby. Basic Technical Communication, Cambridge University Press, New Delhi.2012.

REFERENCE BOOKS

1. Rizvi, Ashraf. Effective Technical Communication, McGraw Hill, New Delhi. 2005
2. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011
3. Tyagi, Kavita& Padma Misra. Basic Technical Communication, PHI, New Delhi. 2011
4. Lewis, Norman. Word Power Made Easy, W.R Goyal Pub. & Distributors.1995
5. Ford A, Ruther. Basic Communication Skills; Pearson Education, New Delhi.2013
6. Aslam, Mohammad. Introduction of English Phonetics and Phonology Cambridge.2003
7. Kameswari, Y. Successful Career Soft Skills and Business English, BS Publications, Hyderabad.2010
8. English Pronouncing Dictionary, Cambridge.2012
9. The Oxford Guide to Writing and Speaking. OUP, Delhi.2011

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20
Professional Communication – I Lab

Lab 1	Neutralization of Mother Tongue Influence through manner of articulation
Lab 2	Common Errors in English and Indianisms.
Lab 3	Introduction to Speech Sounds – Practicing Vowel and Consonant sounds
Lab 4	Syllable, word stress, Sentence stress
Lab 5	Pause group, Intonation & Rhythm
Lab 6	Functional English
Lab 7 & 8	Everyday Conversation : Greetings, Apologies, Requests, At a Restaurant, Shopping, Groceries, Hiring an Apartment, Travel Courses, etc.
Lab 9	Developing Listening skills through cultural movies
Lab 10 &11	Movie - To provide exposure to the target language
Lab 12	Final evaluation based on Extempore

References: (Software and Videos)

1. Wordsworth English Language laboratory software
2. Wordsworth Prep 1-2-3
3. Connected Speech Level 1-2-3
4. Learn To speak English CD 1-2-3-

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Computer Fundamentals and 'C' Programming**			Course Code: **DA1210**
Credit: **4**	L **3**	T **0**	P **2**
Year: **1st**			Semester: **I**

UNIT 1 **(8 L)**

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system: Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

UNIT 2 **(8 L)**

Standard I/O in C, Fundamental data types- Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external**,** Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Fundamentals of C programming: Structure of C program**,** writing and executing the first C program, components of C language. Standard I/O

UNIT 3 **(8 L)**

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch**,** program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break, continue and goto statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

UNIT 4 **(8 L)**

Arrays: Array notation and representation, manipulating array elements using one and two dimensional arrays, linear searching, sorting (bubble sort), strings, matrix manipulation (transpose, addition, multiplication).

Structures: Purpose and uses of structures, declaring structures, array of structures, union, enumerated data types

UNIT 5 **(8 L)**

Pointers: Pointers: pointer variables, pointer operator, pointer expression, array of pointers, multiple indirection, pointers to functions, dynamic memory allocation functions.

File handling**,** standard C preprocessors**,** defining and calling macros, conditional compilation.

Text Books:

1. YashwantKanetkar, "Let us C", BPB Publications, 2nd Edition, 2001.
2. Herbert Schildt, "C:The complete reference", OsbourneMcgraw Hill, 4th Edition, 2002.
3. Computer Fundamentals and Programming in C. ReemaThareja, Oxford Publication
4. P.K. Sinha "Computer Fundamentals" B.P.B Publication.

Reference Books:

1. Raja Raman, "Computer Programming in C", Prentice Hall of India, 1995.
2. Kernighan & Ritchie, "C Programming Language", The (Ansi C Version), PHI, 2nd Edition.
3. Byron Gottfreid "Schaum's Outline of Programming with C".

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20
List of Programs in 'C' Lab

Lab 1	(a) WAP to perform simple arithmetic operations using different data types. (b) WAP to show swap of two no's without using third variable.
Lab 2	(a) WAP to find the roots of a quadratic equation. (b) WAP to check the number is odd or even and find the sum of all odd and all even separately.
Lab 3	(a) WAP to find out whether the given number is prime or not. Find sum of all prime upto N. (b) WAP to reverse a given number and check the palindrome status.
Lab 4	WAP to print corresponding days of a week using switch case.
Lab 5	WAP to find and generate the Armstrong number.
Lab 6	WAP to print pattern triangle like Floyd's, Pascal, pyramid triangle.
Lab 7	(a) WAP to interchange two values using call by value and call by reference. (b) WAP to print factorial of a number using recursion & without using recursion.
Lab 8	WAP to print Fibonacci series. (**a**) Without using function (**b)** using function (**c)** using recursion
Lab 9	(a) WAP to print an array and find greatest/smallest element of an array. (b) WAP to perform linear searching in an array.
Lab 10	(a) WAP to insert/ delete element from an array. (b) WAP to sort the array's element using Bubble sort.
Lab 11	WAP to perform the following string functions. **a.** Strlen **b**. strcmp **c.**strcpy **d**. strcat **e**. strlwr **f**.strupr
Lab 12	Declare a suitable structure of a college and print the name and DOB of the student have scored more than sixty percent marks in end semester exam.
Lab 13	Declare a suitable structure for an organization and print all the names of employees having salary more than Rs.1000.

Course Title: **Workshop Practice**			Course Code: **LA1110**
Credit: **1**	L **0**	T **0**	P **2**
Year: **1st**			Semester: **I / II**

List of Experiments

1. Carpentry: To make a T-Lap joint with soft wood.
2. Arc Welding: To make a Lap joint with mild steel flat by arc welding process.
3. Gas Welding: To make a Lap joint of M.S. sheet with gas welding process.
4. Fitting: To make a plug and socket joint with M.S. flat.
5. Machine Shop: To turn a M.S. rod on lathe to prepare a turning specimen.
6. Sheet Metal: To make a square tray with G.I. sheet.
7. Study of Foundry and Forging tools and equipment's

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Engineering Mathematics – II**	Course Code: **JA2010**
Credit: **3.5**	L **3** T **1** P **0**
Year: **1st**	Semester: **II**

UNIT I: **(10L)**

Linear Algebra

Matrices; Inverse of matrix; Echelon form; Rank of matrix; Consistency and solution of a system of linear equations; Linear dependence and independence of vectors; Matrix transformations; Eigen values and eigenvectors; Cayley– Hamilton theorem; Reduction to diagonal form; Vector spaces; Sub spaces; Basis; Dimension; Linear Transformation**.**

UNIT II: **(8L)**

Differential Equations

Linear differential equations first order and first degree; Linear differential Equations of higher orders with constant coefficients; Complementary functions and Particular integrals; Euler-Cauchy linear differential equations; Simultaneous linear differential equations; Method of variation of parameters.

UNIT III: **(6L)**

Infinite Series

Introduction; Sequences; Series; Convergence; Series of positive terms; Comparison test; Integral test; D'Alembert's Ratio test; Cauchy's root test; Alternating series; Leibnitz rule.

UNIT IV: **(8L)**

Fourier Series

Periodic functions; Fourier series of Periodic functions; Euler's formulae; Functions having arbitrary period; Change of intervals; Even and Odd functions; Half range sine and cosine series.

UNIT V: **(8L)**

Laplace Transform

Laplace Transform; Existence theorem; Properties of Laplace Transform ; Laplace Transform of derivatives and integrals; Laplace Transform of Periodic functions; Unit Step function and Error Function; Dirac- Delta function; Unit impulse function; Convolution theorem; Applications of Laplace Transform to solve linear and simultaneous differential equations.

Text Books:

1. R. K. Jain & S. R. K. Iyenger, **Advanced Engineering Mathematics**, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.
2. E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, John Wiley & Sons, U.K., 2006.

Reference Books:

1. W. E. Boyce and R. Di Prima, **Elementary Differential Equations**, (8th Edition), John Wiley & Sons, U.K., (2005).
2. B. S. Grewal, **Higher Engineering Mathematics**, 42nd Edition, Khanna Publication, New Delhi, India, 2012.

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Engineering Physics**	Course Code: **OA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **II**

UNIT I:
Relativistic Mechanics: Inertial and Non-inertial Frames; Postulates of Special Theory of Relativity; Galilean and Lorentz Transformation; Length Contraction and Time Dilation; Addition of Velocities; Variation of Mass with Velocity and Mass Energy Equivalence.

UNIT II:
Interference: Introduction; Coherent Sources; Analytical treatment of interference; Young's double slit experiment and its analysis; Conditions of Interference; Fresnel's Biprism; fringes with white light; Determination of wavelength of monochromatic light by using Fresnel's Biprism method; Displacement of Fringes; Interference in plane parallel thin film (reflected and transmitted light) and wedge shaped film(reflected light only); Newton's Rings; Determination of wavelength of monochromatic light and determination of refractive index of a liquid by using Newton's ring method.

UNIT III:
Diffraction: Introduction; Difference between Interference and diffraction; resultant of superposition of n simple harmonic coherent vibrations; Fraunhofer diffraction due to single slit: resultant intensity; conditions of maxima; minima; angular and linear width of central maximum; Double slit diffraction: resultant intensity; missing order; N-slit diffraction : resultant intensity; conditions of maxima and minima; missing orders; angular width of principal maxima; Diffraction grating: formation of spectra and missing order spectra in spectrum; dispersive power of grating; Resolving power; Rayleigh Criterion of resolution; Resolving power of plane transmission diffraction grating.

UNIT IV:
Polarization: Polarised and unpolarised light and its pictorial representation; plane of polarisation and plane of vibration; Phenomenon of Double Refraction; positive and negative double refracting crystals; properties of ordinary and extra-ordinary Rays; Nicol Prism and its application as a polariser and analyser; Mathematical analysis of superposition of two linearly polarised light vectors; retardation plates – half wave plate and quarter wave plate; Production and detection of Plane; Circularly and Elliptically Polarized Light.
Laser: Spontaneous emission; stimulated emission and stimulated absorption; Einstein's A and B Coefficients and relation between them; Principle of Laser Action; Construction and Working of He-Ne; Semiconductor Laser.

UNIT V:
Wave Mechanics : Wave Particle Duality; de Broglie Concept of Matter Waves; Davisson and Germer experiment; Concept of wave packet; group and phase velocity; Heisenberg Uncertainty Principle and its applications viz. non existence of electron in nucleus; radius and energy of Bohr's first orbit; Schrödinger time independent and time dependent wave equation; Physical interpretation of wave function; Application of Schrodinger wave equation: Particle in a one dimensional box (eigen function and eigen values).
Introduction to Fibre Optics: Fundamental ideas about optical fiber; Types of fibers; Acceptance angle and cone; Numerical Aperture.

Text Books:

1. AjoyGhatak**; Optics;** Tata Mc-Graw Hill Education;2009.
2. Subramanyam; BrijLal;**A Text Book of Optics**; S. Chand, 2004.
3. K. Thyagarajan, AjoyGhatak; **Lasers: Fundamentals and Applications**; Second;Springer, 2010.
4. AjoyGhatak& K. Thyagarajan ;**Introduction to Fiber optics;**Cambridge University Press,1998.
5. Halliday, Resnick& Walker; **Principles of Physics**; Nineth, Wiley, India;2013

Reference Books:

1. Arthur Beiser ;**Concepts of Modern Physics**; Tata Mc-Graw Hill Education;2003.
2. Robert Resnick;**Introduction to Special theory of Relativity** ; First; John Wiley& Sons; 1968.
3. Jenkins and White ;**Fundamentals of Optics**; Fourth; McGraw-Hill;2001
4. David. J. Griffith; **An Introduction to Quantum Mechanics**;Second; Pearson prentice Hall; 2004.
5. Young and Freedman;**Sears and Zemansky's University Physics**,Tenth; Addison-Wesley, 2000.

List of Experiments

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help ofFresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locatethe position of cardinal points.
4. To determine the specific rotation of cane sugar solution using bi quartz polarimeter.
5. To determine the wavelength of spectral lines using plane transmissiongrating.
6. To determine the specific resistance of the material of given wire usingCarey Foster's bridge.
7. To determine the variation of magnetic field along the axis of a currentcarrying coil and then to estimate the radius of the coil.
8. To verify Stefan's Law by electrical method.
9. To calibrate the given ammeter using potentiometer.
10. To calibrate the give voltmeter using potentiometer.
11. To determine energy band gap of a given semiconductor material by p-n junction method.
12. To determine the viscosity of water by Poisseuille's method.

Note: Additional experiments may be added based on contents of syllabus.

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Course Title: **Essentials of Mechanical Engineering**	Course Code: **LA1210**
Credit: **4.5**	L **3** T **1** P **2**
Year: **1st**	Semester: **II**

UNIT – I **9L**

Introduction to Engineering: Difference between Science and Technology, history of wheel, introduction to prime movers, transmission system, belt, pulleys, gear system and nomenclature, braking system, Mechanism, lever mechanism, Working principle of power generation system, hydel power plant, thermal power plant and its main components.

Coplanar Force system: Resolution of force in two mutually perpendicular direction Free Body Diagram, Moment, Varignon's theorem, static equilibrium, Lami'sTheorem, type of joints/Support, Type of load: point load, uniformly constant and varying loads, beam and its type.

UNIT – 2 **7L**

Engineering material and their properties: Details of hook's law, Proportional limit, Yield point, Yield Stress, Engineering strain, Engineering stress, True stress and Strain, Plasticity, Elasticity, Allowable Strength, Hardness, Ductility, toughness, Fatigue, creep, strain energy, Impact Strength, Young modulus of Elasticity, Bulk Modulus, Poission Ration and its relation in between.

Stress and strain: Normal stress and strain, principle of Superposition, Deformation in stepped and composite bar.

UNIT – 3 **7L**

Thermodynamics: Macroscopic & microscopic study point of view, System, Surrounding and Universe, Phase, Property, State, Path, Process, Cyclic and non-cyclic processes, Quasi static process, Reversible and irreversible processes , Thermodynamic equilibrium, Concept of continuum, Energy and its forms, Enthalpy, Zeroth law, Different temperature scales and theory of temperature and Pressure measurement.

UNIT – 4 **8L**

Laws of Thermodynamics: Thermodynamic definition of work, Thermodynamic processes, Calculation of work in various processes and sign convention, Non-flow work and flow work, Joules' experiment, First law of thermodynamics, Internal energy and enthalpy, First law of thermodynamics applied to open systems, Steady flow energy equation and its applications, First law analysis for closed system (non flow processes), Limitations of first law of thermodynamics, PMM-I.

Statement of Second Law of Thermodynamics: Kelvin Planck's statement and Clausius statement and their equivalence.

UNIT – 5 **9L**

Power generation: Air standard cycle**,** IC Engine**,** Carnot cycle, Otto cycle, Diesel cycle, Important components of I.C.Engine, two stroke and four stoke engine, S.I. and C.I. engines, efficiency of Otto and diesel cycle

Basics of Heat Transfer: Concepts of the mechanisms of heat flows: conduction, convection and Radiation heat transfer application in engineering.

Reference Books:

1. Basu,A.R; A Text book of Engineering Mechanics(Applied Mechanics);2003 Edition; Dhanpat Rai & co.(p) Ltd, Delhi.
2. Chandramouli, P.N; Engineering Mechanics; Second Printing; PHI Learning Private Limited, Delhi; 2013.
3. Rajput, R. K; Material Science; S. K. Kataria & Sons, New Delhi.
4. Dubey, N. H; Engineering Mechanics, Statics and Dynamics; First reprint; McGraw Hill Education (India) Private Limited, New Delhi, 2013.
5. Ratan, S.S; Theory of machines; Second Edition; Tata McGraw Hill Publishing Company Limited, New Delhi.
6. Nag.P.K.; Engineering Thermodynamics; 3rd Edition; Tata McGraw Hill Publishing Company Limited, New Delhi.
7. Nag.P.K.; Heat and Mass Transfer; Tata McGraw Hill Publishing Company Limited, New Delhi.
8. Kumar.D.S; Basic of Mechanical Engineering; S. K. Kataria & Sons, New Delhi.

Essentials of Mechanical Engineering Lab

List of Experiments

1. Tensile test
2. Impact test
3. Hardness test
4. Pulley experiment
5. Experiment on conduction heat transfer
6. Demonstration of Impulse and reaction turbine
7. Study of 4s and 2S engine petrol Engine
8. Study of 4s and 2S engine Diesel Engine
9. Study of refrigerator and air conditioning

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Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Professional Communication – II**	Course Code: **HA2210**
Credit: **3.5**	L **3** T **0** P **1**
Year: **1st**	Semester: **II**

UNIT 1: **PROFESSIONAL COMMUNICATION** **(6 Hrs)**

1. Importance and Features of Business Communication, Flow and Channels of Communication in an Organization.
2. Introduction to Technical Communication, Types and History of Technical Communication.
3. Difference between General and Technical Communication, and Importance of Technical Communication.
4. Characteristic of Technical Communication, and Elements of Style.
5. Process of Preparing a Technical Document.
6. Elements and Features of Scientific Articles.
7. Compunication, E- mail, E- tools and Encyclopedia.

UNIT 2: **BUSINESS CORRESPONDENCE** **(8 Hrs)**

1. Business Correspondence – Principles, Features, Types, Format and Layout of Business Letter.
2. Inter Office Correspondence – Letters of Enquiry, Quotation, Order, Sales, and Complaint.
3. Intra Office Correspondence: Notice, Agenda, Minutes, and Memorandum.
4. Job Application Letter.

UNIT 3: **TECHNICAL PROPOSAL and TECHNICAL REPORT** **(8 Hrs)**

1. Technical Proposal - Introduction, Purpose, Features, Types, Format, Importance, and Writing Technical Proposals and Plagiarism.
2. Technical Report - Features, Types, Style, Format, Relevance, and Writing Technical Reports.

UNIT 4: CORPORATE COMMUNICATION SKILLS **(8 Hrs)**

1. Dimensions and importance of EQ
2. Interpersonal communication skills - Life Position, and Transactional Analysis
3. Johari Window: Role of Feedback and Disclosure in Communication; Accepting Criticism
4. Cross Cultural Communication
5. Attitude
6. Perception
7. Personality Attributes and Communication: Self Esteem, Self-Monitoring, Impression Management, and Locus of Control.
8. Conflict and Negotiation

UNIT 5: PROJECT **(6 Hrs)**

REPORT WRITING/ PROPOSAL WRITING

The students will write a Report **OR** a Proposal consisting of 10-15 pages.

REPORT WRITING

1. **For B.Tech. students**-
    a. Technical Report describing new machinery, a report on the sudden break down in production unit, and market survey report for formulating new market strategy.
2. **For B.Pharma. students**
    a. Technical Report based on the site inspection of a drug manufacturing unit, Survey Report on Health Awareness and Self-Medication.

3. **For B.Arch. students**
    a. Technical Reports based on a Site Inspection for Geographical and Geological aspects of a particular location, A Report on the Architectural Survey of a Monument. Architectural

PROPOSAL WRITING

1. **For B.Tech. students**
    a. Technical Proposal to organize a Technical Training Program, To develop new range of a product and to start a new venture.
2. **For B.Pharma. students**
    a. Technical proposal to establish a new laboratory, To create new drug-composition and to visit to a Super Specialty Hospital.
3. **For B.Arch. students**
    a. Technical Proposal for an Archeological Site visit , To Construct New Buildings.

Report Writing and Proposal Writing carries 30 marks equivalent to three class tests.

TEXT BOOK

1. Gupta, Ruby. Advanced Technical Communication, Cambridge University Press, New Delhi. 2011.

SUGGESTED REFERENCE BOOKS

1. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011.
2. Tyagi, Kavita& Padma Misra. Advance Technical Communication, PHI, New Delhi.2011
3. Technical Communication, Cengage Learning, New Delhi.2010
4. Technical Communication, OUP, New Delhi. 2013
5. Wallace, Masters Personality Development, Cengage Learning, New Delhi.2006
6. Barrass, Robert: Students Must Write, Foundation books, Cambridge, New Delhi.2006
7. Rao, Bhaskar: Successful Career Soft Skills and Business English, BS Publications, Hyderabad.2012
8. Chakrawarthi: Soft Skills for Professionals, Wiley India.2011

Professional Communication – II Lab

Lab 1	Vocabulary Building
Lab 2	Telephone Etiquette: Making an appointment , answering Calls
Lab 3	Public Speaking
Lab 4	Group Discussion: Do's and Don'ts of GD
Lab 5 & 6	Interview Skills: Preparation
Lab 7	PP Presentation Skills: Techniques of making effective presentation
Lab 8	Meeting : Conducting meetings effectively
Lab 9	Developing Negotiating skills
Lab 10 &11	Reading Comprehension
Lab 12	Evaluation

References: (Software and Videos)

1. Wordsworth English Language laboratory software
2. Wordsworth Prep 1-2-3
3. Communicate
4. Train 2 Success
5. Additional PPTs

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Computer Programming in C++**			Course Code: **DA2210**
Credit: **4**	L **3**	T **0**	P **2**
Year: **1st**			Semester: **II**

Unit -1 **8L**

Introduction to Object Oriented Programming, including methodologies, programming techniques, Object Oriented languages.
Overview of C++ basic structures, including the main () function, C++ data types, different type of operators expressions and statements, standard Input/output, Simple flow of control, Defining user defined Functions.

Unit -2 **8L**

General overview of objects and classes, Object and classes in C++, including class definition, Defining members inside or outside, accessing of members, constructors, types of constructors, destructors and Pointer to class object.

Unit-3 **8L**

Polymorphism: function overloading, methods of overloading, constructor overloading, Operator overloading.
General overview of inheritance: Introduction, Categories of inheritance, public/protected/private inheritance, constructors and destructors in derived classes, and Virtual Base class.

Unit-4 **8L**

Function overriding and virtual functions, Abstract class and abstract base class, Friend functions, Templates in C++, function templates, class templates, templates and inheritances, templates and static members.

Unit-5 **8L**

File handing in C++: opening of file, closing of file, text files, binary files, Reading and writing into a file. Exception Handling in C++, including usage, try, throw and catch.

Text Books:

1. Kip R. Irvine, C++ and Object-Oriented Programming, Prentice Hall, 1997
2. R. Lafore, "Object Oriented Programming using C++", BPB Publications, 2004
3. E Balagurusamy "Object Oriented Programming with C++" T.M.H 2nd edition

Reference Books:

1. Schildt Herbert, "C++ Programming", 2nd Edition, Wiley DreamTech.
2. YashwantKanethkar, "Object Oriented Programming using C++",BPB, 2004

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List of Programs in 'C++' Lab

Lab 1	(a) WAP to print first 10 prime numbers. (b) WAP to demonstrate nested loops. (c) WAP to print reverse of a given number. (d) WAP to read two numbers from keyboard and display the larger one.
Lab 2	(a) Create a class called Employee that includes three pieces of information as instance Variables – a first name (type String), a last name (type String) and a monthly salary (Double) (b) Create a constructor in above class to initialize the three instance variables. Provide a get method for each instance variable. (c) WAP to demonstrate destructors.
Lab 3	(a) Program to implement different types of inheritances like Multiple, Multilevel and hybrid. (b) Write a program in C++ demonstrating the public, protected and private parameters. (c) Write a program in C++ to demonstrate destructor in inheritance. (d) WAP to demonstrate encapsulation property of OOPs.
Lab 4	(a) Write a program that uses a class where the member functions are defined inside a class. (b) WAP that uses a class where member functions are defined outside a class. (c) WAP that uses a class where member functions are defined inside a class. (d) WAP to demonstrate the use of Static Data members.
Lab 5	(a) WAP to demonstrate the use of Dynamic Constructor. (b) WAP to demonstrate the use of function Template. (c) Illustrate and implement the C++ program to initiate the base constructor from derived class constructor.
Lab 6	(a) Write a C++ program to find the largest and smallest element of an array.
	(b) Create a class Matrix. Implement all possible matrix operations for Matrix type objects by overloading them.
Lab 7	(a) Create 2 classes OM and DB which store the value of distance. DM store distances in meters and cm and DB in feet and inches. Write a program that can read values for the class objects and add 1 object OM with another object of DB.
	(b) Define a class to represent bank account. Include the following members: **Data members** 1. Name of depositor. 2. Account number. 3. Type of account. 4. Balance amount in the account. **Member functions** 1. To assign initial values. 2. To deposit an amount. 3. To withdraw an amount after checking the balance. 4. To display name and balance. Write a main program to test the program.
Lab 8	(a) WAP to demonstrate static class data. (b) WAP to demonstrate the use of Public, Private and protected classes.
Lab 9	(a) WAP to illustrate the concept of call by reference. (b) WAP to illustrate the concept of unary operator overloading. (c) WAP to illustrate the concept of binary operator overloading.
Lab 10	(a) WAP to demonstrate the use of function overloading. (b) WAP using multiple inheritance for collecting employee details.
Lab 11	(a) WAP using function template to find maximum of two Data. (b) WAP to calculate factorial of given number using copy constructor.
Lab 12	(a) WAP to sort five float and integer numbers using template function (use bubble sort). (b) Demonstrate the use of different types of polymorphism.
Lab 13	(a) Write a function to read a matrix of size M × N from keyboard. (b) WAP to implement aggregation concept.

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Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Environmental Science**	Course Code: **BA1010**
Credit: **2**	L **2** T **0** P **0**
Year: **1st**	Semester: **II**

Unit – 1 **(6L)**

Natural Resources: Renewable and non-renewable resources

Definition, scope, importance and need for public awareness, natural resources and associated problems.

- Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
- Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
- Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture and green revolution, water logging, salinity.
- Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources.
- Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Unit – 2 **(5L)**

Ecosystems

Concept, Structure and function of an ecosystem, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the Forest and aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit – 3 **(5L)**

Biodiversity and its conservation

Introduction – Definition: genetic, species and ecosystem diversity. Bio geographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-sports of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit – 4 **(6L)**

Environmental Pollution

Definition, Cause, effects and control measures of:-

a. Air pollution b. Water pollution c. Soil pollution
d. Marine pollution e. Noise pollution f. Thermal pollution
g. Nuclear hazards

• Solid waste Management and biomedical waste: Causes, effects and control

• Role of an individual in prevention of pollution.
• Pollution effects-global warming, acid rain, ozone depletion, smog and case studies.
• Disaster management: floods, earthquake, cyclone and landslides.

Unit – 5 **(6L)**

Social Issues and the Environment

• From Unsustainable to Sustainable development
• Water conservation, rain water harvesting, watershed management
• Environmental Impact Assessment and Resettlement and rehabilitation problems.
• Climate change
• Wetland conservation.
• Role of remote sensing and GIS in environmental monitoring and analysis
• Environment Protection Act. 1986
• Air (Prevention and Control of Pollution) Act. 1981
• Water (Prevention and control of Pollution) Act 1974
• Wildlife Protection Act 1972
• Forest Conservation Act 1980.

Field work:

• Visit to a local area to document environmental assets river/forest/grassland/hill/mountain
• Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
• Study of common plants, insects, birds.
• Study of simple ecosystems-pond, river, hill slopes, etc.

REFERENCE BOOKS:

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad –380 013, India, Email:mapin@icenet.net (R)
2. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
3. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
4. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
5. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
6. Gleick, H.P. 1993. Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
7. Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
8. Mckinney, M.L. & School, R.M. 1996. Environmental Science Systems & Solutions, Web enhanced edition. 639p.
9. AnubhaKaushik&Kaushik, C.P. 2009.Perspectives in Environmental Studies, New Age International Publishers.
10. Manahan. S.E., Environmental chemistry, 9th edition.

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Engineering Graphics**	Course Code: **LA1220**
Credit: 1	L **1** T **0** P **0**
Year: **1st**	Semester: **II**

UNIT – 1
Introduction: Sheet Layout, Types of Sheet, Size of Sheets, Title blocks, Type of lines, Lettering, Dimensioning, Scale (Full, Reduced, Large) Geometrical Constructions,

UNIT – 2
Projection: Methods of Projection, Planes of Projection, Projection of points, Projection of straight lines, Projection of auxiliary planes, Projection of planes.

UNIT – 3
Projection of solids, Sections of solids.

UNIT – 4
Development of surfaces

UNIT – 5
Isometric Projections

Reference Books:
1) Bhatt N. D. & Panchal V. M, "Engineering Drawing", Charotar Publisher, 2007.
2) Dhanjay A Jolhe, "Engineering Drawing" Tata McGraw Hill, 2008.
3) Gill P.S "Engineering Graphics" S. K. Kataria & Sons, 2009
4) John K.C, "Engineering Graphics" , 2nd edition, PHI Learning Pvt. Ltd., 2010

List of Experiments

1. Introduction to AutoCAD Commands, Explaining need of AUTO CAD over Manual drafting, Simple Drawings.
2. Sheet on Lettering and Geometric construction.
3. Orthographic Projections, Basic problem based on Projection of points.
4. Sheet on Projection of Lines.
5. Sheet on Projection of Planes.
6. Sheet on Projection of Auxiliary Planes.
7. Sheet on Projection of Solids.
8. Development of Surfaces.
9. Sheet on Isometric Projections from orthogonal views.

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Applied Geology – I**	Course Code: **MA3210**
Credit: 4.5	L **3** T **1** P **2**
Year: **2nd**	Semester: **III**

UNIT – 1 **8L**

Origin of Earth, Earth's structure: Core, mantle and crust; geological time scale and geological processes.

UNIT – 2 **8L**

Rock types: igneous, sedimentary and metamorphic process and rocks. Geological markers. Rocks and minerals; properties and identification in hand specimen and under microscope

UNIT – 3 **6L**

Stratigraphy: Litho-stratigraphy, biostratigraphy and Chrono stratigraphy.

UNIT – 4 **8L**

Fossils, mode of preservation and significance stratigraphy of major sedimentary basins in India.

UNIT – 5 **10L**

Structural Geology: Rock-structure types; fault, topography and outcrops. Folds, faults, joints & unconformities; classification and recognition. Igneous intrusion - dykes, Sill and batholith. Significance of structural type in petroleum exploration.

Books:

1. Parbin Singh, "Engineering and General Geology", Katson Publication House, 1987.
2. G.B. Mahapatra, "A text book of Geology", CBS Publisher, 1st edition
3. Marland P. Billings "Structural Geology", Prentice-Hall, 1972 Third edition.
4. John D. Winter, "An Introduction to Igneous and Metamorphic Petrology", Library of Congress Cataloging-in-Publication Data, 2001.

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Introduction to Petroleum Operation**	Course Code: **MA3010**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **2nd**	Semester: **III**

UNIT – 1 **6L**

Occurrence of oil and gas in subsurface structures. Geological and geo-physical exploration for oil and gas pools.

UNIT – 2 **10L**

Drilling for oil and gas. Rotary drilling. Rig types and components. Drilling bit types; drill string and circulation system. Well planning; casing cementation. Slant/horizontal wells.

UNIT – 3 **8L**

Casing perforation, well activation. Well head equipment. Production tubing. Well productivity evaluation. Artificial lift methods. Gas lift, plunger lift, Sucker rod pumping etc.

UNIT – 4 **6L**

Surface treatment of oil/gas stream. Oil/gas/water separation, demulsification, storage, rate measurement, transportation.

UNIT – 5 **10L**

Petroleum Reservoir, Reserve estimation, field development, safety and environmental pollution problems. Field treatment of Oil and Gas. Crude oil refining and Natural Gas processing.

Books:

1. Joe Dunn Clegg, Production Operations Engineering, Vol-IV, SPE (Larry W. Lake, Petroleum Engineering Handbook).
2. John R. Fanchi, General Engineering, Vol. I, SPE (Larry W. Lake, Petroleum Engineering Handbook).
3. Bradley H B, Petroleum Engineering Handbook, third edition, SPE, 1992.
4. Warner H R, Emerging and Peripheral Technologies, Vol. VI, Petroleum Engineering Handbook, SPE, 2007.

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Engineering Mathematics – III**	Course Code: **JA3010**
Credit: 3.5	L **3** T **1** P **0**
Year: **2nd**	Semester: **III**

UNIT – 1 **10L**

Functions of a complex variable:
Analytic functions, Canchy – Riemann equations, Harmonic functions, Line internal in the complex plane, Canchy's integral theorem, Canchy's integral formula for derivatives of analytic function.

UNIT – 2 **8L**

Power series, Taylor's series Laurent's series Residue, Poles, Zeros, singularities, Residue Theorem, Evaluation of real integrals of the type

$$\int_0^{2\pi} f(\cos\theta, Sin\theta)d\theta \;\&\; \int_{-\infty}^{\infty} f(x)dx$$

UNIT – 3 **8L**

Statistical Techniques.
Moments, Moment generating function, skewness, kurtosis, Curve fitting, Method of least square, Fitting of straight lines, Polynomials, Exponential curves etc., Correlation and Regression, Binomial, Poisson & Normal Distribution.

UNIT – 4 **8L**

Integral Transform.
Fourier integral, Fourier complex transform. Fourier sine and cosine transform, Hankel transform and its application.

UNIT – 5 **8L**

Series solution of ODE of 2nd order with variable coefficient with special emphasis to differential equation of Legendre and Bessel, Legendre Polynomial, Bessel functions and their properties.

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Course Title: **Engineering Physics – II**	Course Code: **OA3010**
Credit: 3.5	L T P **3 1 0**
Year: **2nd**	Semester: **III**

UNIT – 1 **10L**

Electromagnetics: Physical significance of gradient, divergence and curl, Ampere's law and displacement current, Maxwell's equations in Integral and Differential forms, Electromagnetic wave propagation in free space: wave equation, wave velocity, transverse nature, intrinsic impedance, Wave propagation in conducting media: wave equation, propagation constant, attenuation constant, skin depth, Poynting vector and Poynting Theorem.

UNIT – 2 **10L**

Quantum Mechanics:

Applications of Schrödinger time independent wave equations: Particle in 3 dimensional box, Potential well, Potential barrier and tunneling effect, Hydrogen atom, Kronig-Penny model.

UNIT – 3 **8L**

Crystallography:

Unit cell, space lattice, seven system of crystals , Bravais space lattice (sc, fcc, bcc), packing fraction, coordination number, Miller Indices, Lattice constant, Lattice spacing, lattice planes, Bragg's law of diffraction, Crystal structure, Laue equation

UNIT – 4 **8L**

Semiconductor Materials:

Group-IV materials, Covalent bond, electron-hole concepts,Basic concepts of energy bands in materials, concept of forbidden gap, Intrinsic and extrinsic semiconductors, donors and acceptors impurities, p-n junction, depletion layer, V-I characteristics, diode resistance, capacitance, zener diode

UNIT – 5 **8L**

Dielectrics:

Dielectric constant, Dielectric polarization, dielectric susceptibility, Relation between P & E, Types of polarization, temperature and frequency dependence of polarization, ClaussiusMossotti, equation, Dielectric loss, Basic concept of piezoelectricity, Ferroelectricity and Pyroelectricity.

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Course Title: **Essentials of Mechanical Engineering-II**	Course Code: **LA3090**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **2nd**	Semester: **III**

UNIT – 1 **12L**

Review of First law of Thermodynamics: its application: fuels & combustion, Theoretical air/fuel ratio, adiabatic temperature, Second Law of thermodynamics & its applications: Heat engine, heat pump/refrigerator, reversible and irreversible processes, criterion of reversibility, Thermodynamics temperature scale, Entropy, calculation of entropy change, Principle of entropy increase, T-S diagram, Second law analysis of control volume. Thermodynamic Potentials, Maxwell relations, Availability, Phase rule.

UNIT – 2 **8L**

Power generator: Prime moves: Types & Choice, Internal combustion engines, Gas turbine, Factors affecting engine performance, Trouble shooting, Cogeneration & Transmission: Mechanical & Electromagnetic.

UNIT – 3 **12L**

Mechanics of Solid: Free body diagram, conditions of equilibrium, Friction factor, Force-deformation relationship, Force analysis (axial force, Shear forces, bending moment and twisting moment diagrams), Stress in spherical and cylindrical shells, Thin walled pressure vessels. Concept of stress at a point, Principle stresses, concept of strain at a point, Principle strains, principle of elasticity, plasticity, strain hardening, concept of isotropy, orthotropy, anisotropy, bending of beams, combined stresses, concept of elastic instability, Introduction of column buckling.

UNIT – 4 **8L**

Engineering Material & Manufacturing: Engineering material special materials (nanomaterials, polymers) and their properties, Introduction to manufacturing process, classification, casting, metal forming, plastic deformation, hot & cold working, bulk deformation process etc

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Course Title: **Basic Surveying**	Course Code: **CA3230**
Credit: 4.5	L T P **3 1 2**
Year: **2nd**	Semester: **III**

UNIT-I

Introduction: Importance of surveying to engineers. Types and classification of survey. Concept of scale, Symbols &colours, Principles of surveying. Concept of field and office work. Horizontal and vertical control. Units of measurement. Definition of maps and understanding topographical maps of Survey of India.

UNIT-II

Horizontal Control: Operation and use of metric chain and tape. Sources of errors and corrections. Use of ranging rods, cross staff, arrows, pegs etc. Use of prismatic compass and - Surveyor's compass - Bearings - Whole circle and Reduced Bearing -Traversing - Local attraction - Magnetic dip and declination. Plane table survey and accessories- Radiation, intersection and traversing.

UNIT-III

Vertical Control: Definitions of terms used in levelling, different types of levels, adjustments, bench marks. Booking and reducing the levels- rise and fall method and plane of collimation method. Profile levelling- longitudinal and cross sectioning – Plotting. Contouring- definition and characteristics of contours. Uses of contours. Methods of contouring-direct and indirect.

UNIT-IV

Theodolite Survey: Definition – types, principle and fundamental axes. Temporary adjustments. Measurements of horizontal and vertical angles. Method of repetition and Reiteration. Finding out height and elevation of object by single and double plane method. Curves: Simple curve-Elements of simple curves. Designation of a curve. Setting out simple curve Tabulation and setting out of compound curve, reverse curve, transition curve, combined curve and vertical curves.

UNIT-V

Areas and Volumes: General methods for determining areas. Areas from offsets to a base line, area by double meridian distances, coordinates, map measurements and planimeter. Measurement of volume by prismoidal and trapezoidal formula, volume from spot levels and volume from contour plans.

LIST OF EXPERIMENTS

1. Study of different types of maps, their scales, latitude, longitude, colours and symbols.
2. Setting out polygons using prismatic compass& Location of details using compass traversing.
3. Method of radiation and intersection by plane tabling.
4. Two point and three point problem.
5. Finding elevations using dumpy level with change point and using plane of collimation method.
6. Plotting of contours by block levelling.
7. Finding horizontal angle by method of repetition, method of reiteration and measurement of vertical angles.
8. Finding out height and elevation of an object by single plane method.
9. Longitudinal and cross sectioning and plotting using AutoCAD.
10. Setting out simple curves by offsets from long chord & chord produced method.
11. Setting out simple curves by Rankine's deflection angle method.

Text Book:

1. Punmia, B. C., Jain, A. K., "Surveying", Laxmi Publications Pvt. Ltd., New Delhi, Vol. I, 16th Edition, 2005.
2. Punmia, B. C., Jain, A. K., "Surveying", Laxmi Publications Pvt. Ltd., New Delhi, Vol. II, 15th Edition, 2005.
3. Roy, S. K., "Fundamentals of surveying", Prentice Hall of India, New Delhi, 2nd Edition, 2010.
4. Basak, N. N., "Surveying and Levelling", Tata McGraw-Hill Publishing Company Ltd., 2008.

Reference Books:

1. Chandra, A. M., "Plane Surveying", New age International, 2nd Edition, 2006.
2. De, A., "Plane surveying", S. Chand and Company Ltd., 2000.

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Course Title: **Fluid Mechanics and Machinery**	Course Code: **MA4210**
Credit: 4.5	L T P **3 1 2**
Year: **2nd**	Semester: **IV**

UNIT – 1 **8L**

Newtonian and non-Newtonian fluids. In compressible and compressible flow. Two-phase flow. Friction factor estimation. Straight pipe bends, elbows, converging diverging section.

UNIT – 2 **6L**

Fluid pressure measurement. Piezometers, Manometers, Flow of fluid in pipes and flat surfaces.

UNIT – 3 **8L**

One and two dimensional flow equations. Bernoulli's equation, application, venturimeter, orifice meter. Equivalent length. Slurry transport.

UNIT – 4 **10L**

Pumps: Types, reciprocating and rotary pumps, construction details, performance characteristics. Single & multistage operation. Turbine pumps: multistage turbine pumps.

UNIT – 5 **8L**

Compressors: Types, Rotary and centrifugal. Single stage and multi stage. Construction details and performance characteristics.

Text Books:

1. Fluid Mechanics; R.K. Bansal.
2. Fluid Flow Operations; K.A. Gavhane; NBP

Course Title: **Heat Transfer Process**	Course Code: **MA4220**
Credit: 4.5	L T P **3 1 2**
Year: **2nd**	Semester: **IV**

UNIT – 1 **6L**

Heat transfer modes: conduction, convection, Radiation.

UNIT – 2 **6L**

Heat flow through solid and fluid; steady and unsteady heat transfer; heat transfer coefficient.

UNIT – 3 **8L**

Heat transfer to fluid without and with phase change. Evaporation.

UNIT – 4 **12L**

Heat exchange equipment: types, construction details. Operating characteristics: shell & tube, double pipe, extended surface heat exchangers. Heat exchange fouling. Remedial action.

UNIT – 5 **8L**

Pipe still furnace: construction details and operational characteristics.

Text Books:

1. Process Heat transfer; by D.Q Kern, TMH Publication
2. A course in Heat & Mass Transfer; by Domkundwar, Dhanpatrai publication
3. Unit operations of chemical engineering; by McCabe, Smith &Harriot

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Batch: 2016-20

Course Title: **Drilling Fluid and Cements**	Course Code: **MA4230**
Credit: 4.5	L T P **3 1 2**
Year: **2nd**	Semester: **IV**

UNIT – 1 **8L**

Types of drilling fluid: water-base and oil base, components of drilling fluid system: bentonite types and hydration characteristics; properties, sp.gr. viscosity.

UNIT – 2 **6L**

Fluid-loss characteristics, filtrate resistively caking characteristics.

UNIT – 3 **8L**

Oil-base drilling fluid system; saline mud system. Additives used to control drilling fluid system.

UNIT – 4 **10L**

Oil-well cements; composition, cement slurry components, setting and rheological behavior of cement slurry, strength characteristics of set cement-mass additives used to modify cement slurry characteristics.

UNIT – 5 **8L**

Cement-slurry preparation and down hole displacement processes and system.

Text Books:

1. Gatlin C.; Petroleum Engineering, Drilling and Well Completions, Prentice Hall.
2. Azar, J. J., G. Robello Samuel; Drilling Engineering, Penn Well.
3. Drilling Mud and Cement Slurry Rheology Manual; Gulf Publishing Company.
4. Smith.P.K'Cementing' SPE Pulications 2nd Edition 1976.

Course Title: **Applied Geology – II** **(Sedimentary & Petroleum Geology)**	Course Code: **MA4010**
Credit: 3.5	L T P **3 1 0**
Year: **2nd**	Semester: **IV**

UNIT – 1 **8L**

Sedimentary process: Morphology and textural properties. Sedimentary structure. Important sedimentary groups: sand stone, carbonates.

UNIT – 2 **6L**

Sedimentary environment reconstruction. Sequence stratigraphy.

UNIT – 3 **6L**

Sedimentology and petroleum exploration. Basin modeling.

UNIT – 4 **10L**

Origin of oil source rock and maturation process. Migration of petroleum: mechanism, path, barriers reservoirs rocks and cap rocks.

UNIT – 5 **10L**

Petroleum entrapment – process and types. Geology of prospective basins in India: on shore & off-shore.

Text Books:

1. Sam Boggs. Jr., "Principles of Sedimentology and Stratigraphy", 5th edition 2011
2. Leverson, "Geology of Petroleum", 2006.
3. Richard C. Selley., "Elements of Petroleum Geology", 2nd edition, 1997.
4. Bhagwansahay., "Petroleum Exploration and Exploitation Practices" Allied Publishers, 2001

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Course Title: **Chemical Thermodynamics**	Course Code: **MA4020**
Credit: 3.5	L T P **3 1 0**
Year: **2nd**	Semester: **IV**

UNIT – 1 **6L**

Compression/expansion of ideal and non-ideal gases. Horse power calculations. Single, double and multi-stage operation.

UNIT – 2 **10L**

Thermodynamics of Gases and Liquid Hydrocarbons: Force energy, work function, Mollier diagram, perfect and imperfect gaseous mixtures. Equation of state, Law of corresponding states, Joule-Thompson effect, Arrhenius equation, Activation energy, Fugacity and fugacity coefficient, Lewis fugacity rules. Third law of thermodynamics.

UNIT – 3 **8L**

Solution Thermodynamics: Vapour-liquid equilibria, partial molar properties, chemical potential, Raoult's Law and Henry's Law. ideal and non-ideal solutions, activity and activity coefficients.

UNIT – 4 **8L**

Gibb's – Duhem equation, Gibb's adsorption equation. Phase rule: Single, two and multicomponent system. Phase behavior, Phase equilibria calculations. Ternary and pseudo-ternary phase diagrams.

UNIT – 5 **8L**

Fluid flow thermodynamics: multiphase flow in vertical, inclined and horizontal conduits. Pressure traverse and calculation. Thermodynamics of multiphase multi-component system.

Text Books:

1. Introduction to Chemical Engineering Thermodynamics; J M Smith; TMH.
2. Thermodynamics an Engineering Approach; Cengel and Boles.

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Course Title: **Oil & Gas Well Drilling Technology and Well Completion**	Course Code: **MA4030**		
	L	T	P
Credit: 3.5	**3**	**1**	**0**
Year: **2nd**	Semester: **IV**		

UNIT – 1 **8L**

Site selection. Rig selection. Choice of drilling methods. Rotary drilling rig components. Rocks bit types and operational characteristics: Drill string components drill pipe, drill collar, Kelly.

UNIT – 2 **8L**

Load estimation and choice of material, joint types, casing types and scheme. Stress condition in casing string; design factors. Casing head system. Casing seat selection.

UNIT – 3 **8L**

Oil-well cement and casing cementation. Cement-slurry design for efficient mud displacement, Cementing quality evaluation: height of the cement, cement bonding with casing and formation.

UNIT – 4 **10L**

Use of logging methods for quality assessment; cement bond log. Formation isolation testing. Formation drill-ability; factor affecting; load on bit, rotational rpm; drilling fluid characteristics.

UNIT – 5 **6L**

Well orientation survey. Well deflection; direction determination and presentation

Books;

1. Drilling Engineering-A complete well planning approach; Neal J. Adams; PennWell publishing Company; Tulsa, Okhlama.
2. Drilling Well Completions; Carl Gatlin, PHI
3. Applied Drilling Engineering; Adam T. Bourgyne Jr., Keith K. Milheim; SPE
4. Casing design theory and practice; S.S. Rahman, G.V. Chilingarian; Elsevier

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Elements of Reservoir Engineering**	Course Code: **MA5210**
Credit: 4.5	L: **3** T: **1** P: **2**
Year: **3rd**	Semester: **V**

UNIT – 1 **8L**

Reservoir rock properties: Porosity, Permeability; evaluation. Parallel and series bed systems. Fluid saturation, effective and relative permeability, wettability, capillary pressure characteristics; evaluations and significance.

UNIT – 2 **10L**

Reservoir Fluid System: Volumetric and phase behavior of multi-component oil/ gas system. Formation volume factor for oil and gas, viscosity, reservoir fluid sampling, PVT properties: measurement, estimation and application.

UNIT – 3 **8L**

Fluid flow through Porous media: Darcy's law, single and multi-phase system, linear, radial and spherical flow, steady and unsteady state flow. Flow through fracture, GOR and WOR equations.

UNIT – 4 **6L**

Reservoir pressure determination: Pressure measurement techniques, Bottom hole pressure gauges, determination of reservoir pressure, significance.

UNIT – 5 **8L**

Reservoir drives: Depletion, water drive, gas cap drive, combination drive, recovery factor. Reserve estimation: Resource and reserve, SPE classification of reserve, Volumetric reserve estimation.

Books:

1. Reservoir Engineering Handbook, Tarek Ahmed
2. Applied Petroleum Reservoir Engineering, B.C. Craft &M.Hawldne
3. Fundamentals of Reservoir Engineering by L.P. Dake, Shell learning &development, Elsevier publication

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Unit Operation**	Course Code: **MA5220**
Credit: 4.5	L T P **3 1 2**
Year: **3rd**	Semester: **V**

UNIT – 1 **8L**

Momentum, heat and mass balance in multi-component system, heat transfer process: Modes of heat transfer, heat flow through solid and fluid steady and unsteady state heat transfer.

UNIT – 2 **6L**

Heat transfer coefficient: conductive, convective and overall-heat transfer to fluid with phase change.

UNIT – 3 **8L**

Heat exchange equipment and their performance characteristics.

UNIT – 4 **6L**

Mass transfer and application. Phase equilibrium, diffusion and inter-phase mass transfer.

UNIT – 5 **12L**

Mass transfer processes: distillation, absorption, extraction, stage and continuous contact mass transfer units – plate column, packed bed and fluidized bed.

Books:

1. Unit Operations of Chemical Engineering; Warren L. McCabe; MHIE
2. Mass Transfer Operations; Robert. E. Treybal; MHB.

Course Title: **Petroleum Production Operation – I**	Course Code: **MA5010**
Credit: 3.5	L T P **3 1 0**
Year: **3rd**	Semester: **V**

UNIT – 1 **8L**

Production well equipment: tubing heads, Christmas tree valves and chokes, flow tubing and flow line performance.

UNIT – 2 **8L**

Self-flow well characteristics, productivity and GOR, fluid production handling system, group gathering station, layout separation system.

UNIT – 3 **10L**

Artificial-lift methods of production: continuous gas-lift and intermittent gas lift: principle, system and performance.

UNIT – 4 **8L**

Sucker rod pumping methods: system characteristics, plunger and rod stress conditions.

UNIT – 5 **6L**

Dynamometer system and applications, down hole pumping system.

Books:

1. Production Operations Vol.- 1 & Vol. 2, Thomas O. Allen & Alan P. Roberts.
2. Surface production Operation Vol.-1 & Vol. 2, Ken Arnold & Maurice Stewart
3. Well Completion and Servicing, D. Perrin, Editions Technip
4. The Technology of Artificial Lift Methods, Vol, 1, Kermit E. Brown, H. Dale Beggs

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Course Title: **Petroleum Exploration Methods**	Course Code: **MA5020**
Credit: 3.5	L T P **3 1 0**
Year: **3rd**	Semester: **VI**

A. Geological and geo-chemical methods:

UNIT – 1 **7 L**

Surface indication of oil/gas accumulation. Accumulation parameters; Regional and local structures. Time of generation vis-à-vis accumulation.

UNIT – 2 **7 L**

Geochemical methods of prospecting: Soil-chemical survey, source-rock characterization; Hydro-geochemistry as exploration tool. Plate tectonics and hydrocarbon accumulation.

UNIT – 3 **6 L**

Geological exploration processes: Sequence of operation. Field development: Prognostication of reserve.

B. Geophysical exploration methods and their significance

UNIT – 1 **5 L**

Magnetic survey – survey instruments Geo-magnetic anomalies, field methods, Data correction and reduction. Anomaly interpretation. Response for different type of geological structures.

UNIT – 2 **5 L**

Gravity method:Units, Measuring instruments, Gravity anomaly, Data correction and reduction. Free- air and bouguer anomalies. Anomaly interpretation. Application.

UNIT – 3 **10 L**

Seismic methods: Type, Methodology of refraction profiling. Field survey arrangements. Recoding instruments. Data correction, special shooting methods: Fan and broadside. Data interpretation and application in identification of structures. Reflection seismograph and seismogram relative advantage over refractive survey. Common depth point profiling and stacks time correction. Well seismic methods. Vertical seismic profiling. Interpretation. 3D data acquisition and interpretation, application of reflection survey.

Books:

1. Allen P A and J R Allen, Basin Analysis: Principles and Applications, Second edition, Wiley Blackwell, 2005
2. Beacon, M, simm,RabdRedshaw, T. 3D Seismic Interpretation. Cambridge University Press, 2003.212 pp.
3. Coffeen J. A., “Interpreting Seismic Data Workbook”, Penn Well Books, 1984.
4. Dobrin M. P. and Savit C. H., “Principles of Geophysical Prospecting”, 4t h Edition, McGraw Hill Publishing Company, 1988.
5. Tedesco S. A., “Sur face Geochemistry in Petroleum Exploration” Chapman and Hall Publishing, 1993.

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Course Title: **Engineering Economics**	Course Code: **GC5010**
Credit: 2	L T P **2 0 0**
Year: **3rd**	Semester: **V**

UNIT-I

Time value of money: Simple and compound interest, Time value equivalence, Compound interest factors, Cash flow diagrams, Calculation, Calculation of time –value equivalences. Present worth comparisons, Comparisons of assets with equal, unequal and infinite lives, comparison of deferred investments, Future worth comparison, payback period comparison.

UNIT-II

Use and situations for equivalent annual worth comparison, Comparison of assets of equal and unequal life. Rate of return, Internal rate of return, comparison of IIR with other methods, IRR misconceptions.

UNIT-III

Analysis of public Projects: Benefit/ Cost analysis, quantification of project, cost and benefits, benefit/ cost applications, Cost –effectiveness analysis.

UNIT-IV

Depreciation, computing depreciation charges, after tax economic comparison, Break-even analysis; linear and non-linear models. Product and Process Costing, Standard Costing, cost estimation, Relevant Cost for decision making, Cost control and Cost reduction techniques.

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Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Computer Based Numerical Techniques**	Course Code: **JA5210**
Credit: 4.5	L **3** T **1** P **2**
Year: **3rd**	Semester: **V**

UNIT - 1

Introduction to numerical computing; Approximations and Errors in numerical computations; Truncation and Round off errors; Propagation of errors; Root finding: Bisection method; Regula-falsi method; Iteration method; Newton Raphson method; Rate of convergence of above methods.

UNIT – 2

Matrix algebra; Solution of simultaneous linear algebraic equations: Gauss elimination; Gauss Jordan method; LU Decomposition method; Jacobi method; Gauss Seidel method.

UNIT – 3

Interpolation and Extrapolation: Finite differences; Difference table; Newton's forward and backward interpolation formula; Divided differences and Newton's divided difference formula; Numerical differentiation; Numerical integration: Trapezoidal; Simpson's rules and Weddle's formula.

UNIT – 4

Numerical solution of O.D.E.: Taylor series method; Euler's method; Modified Euler's method; Forth order Runge-Kutta methods; Multistep methods: Milne's method; Adams Bashforth method.

Text Books:

- S.S. Sastry, **Introductory Methods of Numerical Analysis,** 4th edition, PHI learning Pvt. Ltd, 2005.
- M.K Jain, S.R.K Iyengar and R.K Jain, **Numerical Methods for Scientific and Engineering computation, 4th**Edition, New age International Publishers, 2003.

Reference Books:

- B. S. Grewal, **Numerical Methods in Engineering and Science,** (9th Edition), Khanna Publishers, New Delhi, India, 2010.
- Curtis F. Gerald and Patrick O. Wheatley**, Applied Numerical Analysis,** 7th Edition, Pearson Education Lt, 2009.

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Course Title: **Petroleum Production Operation – II**	Course Code: **MA6010**
Credit: 3.5	L T P **3 1 0**
Year: **3rd**	Semester: **VI**

UNIT – 1 **6 L**

Extraneous Gas and water entry in to well bore; source identification and control measures.

UNIT – 2 **10 L**

Sand production and control: Sand control techniques, produced sand analysis, gravel size selection, gravel-packing fluid and gravel packing techniques.

UNIT – 3 **10 L**

Well work-over problems, rig selection, Rigless work-over, coiled tubing system. Work-over fluid design. Planning and economics.

UNIT – 4 **8 L**

Oil and gas separation process optimization, separation system.

UNIT – 5 **6 L**

Crude oil storage; underground gas storage. Effluent treatment and disposal.

Books:

1. Thomas O. Allen & Alan P. Roberts**,** Production Operations Vol.- 1 & Vol. 2.
2. Ken Arnold & Maurice Stewart, Surface Production Operation Vol.-1 & Vol. 2, Second Edition, Gulf Publishing Company, 1986.
3. D. Perrin, Editions Technip, Well Completion and Servicing.

Department of Petroleum Engineering
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Batch: 2016-20

Course Title: **Formation Evaluation**	Course Code: **MA6020**
Credit: 3.5	L T P **3 1 0**
Year: **3rd**	Semester: **VI**

UNIT – 1 **4 L**

Direct methods: core evaluation, mud and cutting analysis and significance.

UNIT – 2 **10 L**

Indirect Methods: SP log: principles and application, Resistivity logs: principles; electrodes systems: Normal, lateral, latero logs; Non-electrode system: Induction log; principles and application.

UNIT – 3 **8 L**

Resistivity departure curves: Origin and application. Acoustic logs: Ultrasonic wave velocity propagation through formation and relevant factors: Wave amplitude and relevant factors; CBL.

UNIT – 4 **8 L**

Radioactivity Logs: Natural gamma-ray and neutron-log: Principles, system and application. Special logging methods: Casing inspection tools, formation micro scanner, NMR log. Logging high angle wells.

UNIT – 5 **10 L**

Interpretation and analysis: Formation types, thickness and sequence construction; fluid saturation determination. Standard interpretation methods. Cross-plotting methods; neutron-density, sonic density, clean and shaly sand interpretation.

Books:

1. Bhagwansahay., "Petroleum Exploration and Exploitation Practices" Allied Publishers, 2001.
2. Richard C. Selley., "Elements of Petroleum Geology", 2nd edition, 1997

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Course Title: **Applied Petroleum Reservoir Engineering**	Course Code: **MA6030**
Credit: 3.5	L T P **3 1 0**
Year: **3rd**	Semester: **VI**

UNIT – 1 **6 L**

Gas, gas-condensate and oil reserves: Identification from fluid composition, production characteristics. Reservoir drive mechanics.

UNIT – 2 **8 L**

Material balance equation: generalized and specific form for different drive systems. Drive-type identification. Rock and fluid compressibility factor; Recovery factor estimation.

UNIT – 3 **6 L**

Performance prediction; water influx estimation. Drive-Index: reservoir pressure maintenance, choice and system.

UNIT – 4 **10 L**

Immiscible displacement process: Fractional flow and fractional displacement process in linear reservoir. Buckeley and Leverett treatment. Reservoir water flood performance.

UNIT – 5 **10 L**

Oil and gas field development:Injection-Production wells distribution patterns and characteristics. Optimum well spacing from techno economic analysis of field performance. Well and field production rate estimation, investment and operational cost, profitability estimation.

Books:

1. Oil & Gas Field development,Dr. Santkumar
2. Reservoir Engineering Handbook, Tarek Ahmed
3. Petroleum Reservoir Engineering, James.W. Amyx

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Course Title: **Petroleum Refining and Petrochemicals**	Course Code: **MA6040**
Credit: 3.5	L T P **3 1 0**
Year: **3rd**	Semester: **VI**

UNIT – 1 **6 L**

Crude oil evaluation, choice of crude types for a product mix.

UNIT – 2 **8 L**

Distillation system: pipe still heater, distillation column, heat exchangers condenser, reflux control, pressure control; vacuum distillation system.

UNIT – 3 **8 L**

Other refining processes: Cracking, reforming, alkylation, isomerization, hydro-processing.

UNIT – 4 **8 L**

Specialty products: Lube oil production, propane de-asphalting, solvent extraction, dewaxing, coke and carbon black production.

UNIT – 5 **10 L**

Petro-chemical feed stock: BTX, olefins: method ethane and butane treated products from natural gas. Storage and safety measures: Floating roof tanks, spherical storage vessels; fire safety measures.

Books:

1. Mall I.D. "Petrochemical Process Technology", Macmillan India Ltd,2007
2. Gary J.H. and Handework G.E., "Petroleum Refining Technology and Economics", Marcel Dekker, Inc., 1984.
3. B.K.Bhaskara Rao, 'Modern Petroleum Refining Processes', Fifth Edition, Oxford and IBH Publishing Co. Pvt. Ltd. (2007)

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Course Title: **Oil and Gas Well Testing**	Course Code: **MA6050**
Credit: 3.5	L T P **3 1 0**
Year: **3rd**	Semester: **VI**

UNIT – 1 **6 L**

Drill stem testing, RFT, Wire-line Testing: System. Interpretation.

UNIT – 2 **6 L**

Flow of compressible fluid through porous media; Unsteady state, semi-steady state fluid flow equations, diffusivity equation. Solution techniques.

UNIT – 3 **10 L**

Pressure-transient tests: pressure draw-down, build-up test, interpretations; skin factor.

UNIT – 4 **8 L**

Multi-rate test, Reservoir limit test, Injection and fall-off test, interference testing, pulse testing.

UNIT – 5 **10 L**

Type curves: generation and interpretation. Gas well testing, fractured wells, dual porosity reservoirs.

Books:

1. Pressure buildup and flow tests in wells; C.S. Mathews and D.G. Russel; Vol-1; SPE
2. Gas Reservoir Engineering; John Lee, Robert A. Wattenbarger; Vol-5; SPE
3. Advances in Well Testing; Robert C. Earlougher; Vol-5; SPE

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Principles of Management**	Course Code: **HA5010**
Credit: 2	L T P **2 0 0**
Year: **3rd**	Semester: **VI**

UNIT – 1
Introduction to Management
Theories of management: Traditional behavioral, contingency and systems approach. Organization as a system.

UNIT – 2
Management Information
Interaction with external environment, Managerial decision making and MIS.

UNIT – 3
Planning Approach to Organizational Analysis
Design of organization structure; Job design and Enrichment; Job evaluation and merit rating.

UNIT – 4
Leading and Control
Theories of motivation, Leadership styles and managerial grid. Co-ordination, Monitoring and Control in organizations. Techniques of Control. Japanese management techniques.

Minor Project: Submission of 15 pages of Case Studies on above.

Suggested Books:

1. Peter Drucker, Harper and Row: The Practice of Management.
2. *Koontz H*, Weihrich,H. Essentials of Management, *Tata McGraw-Hill* Education, 2006.
3. Schermerhorn, John R. Management and OrganisationalBehaviour Essentials, Wiley India,2005
4. Staner: Management, PHI Learning
5. Hirschey. Managerial Economics, Cengage Learning, 2009.
6. Chhabra, A. Principle of Management, Sun India publication , 2012

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Petroleum Engineering System Design**	Course Code: **MA7010**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VII**

UNIT – 1 **10 L**

Choice of well profile: drill string and casing design. Rig choice for load and installed power for a drill well.

UNIT – 2 **8 L**

Design of cementing operation for a drilling. Specification of casing head and well head system.

UNIT – 3 **6 L**

Specification of optimum separation process and system for a given type of oil production.

UNIT – 4 **6 L**

Design of sucker-rod pumping production system.

UNIT – 5 **8 L**

Design of gas-lift production system for continuous and intermittent gas-lift systems.

Books:

1. Well Performance; Michael Golan; Norwegian university of science and technology.
2. Production optimization; H. Dale Beggs; OGCI and Petroskills publications.

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Reservoir Simulation**	Course Code: **MA7020**
Credit: 3.5	L T P **3 1 0**
Year: **4th**	Semester: **VII**

UNIT – 1 **6 L**

Model types:Physical, analog and mathematical. Single-phase, multi-phase in one, two and three dimension mathematical model for reservoir fluid flow. Grid blocks and Grid orientation.

UNIT – 2 **6 L**

Model Equations: Black oil and composition models. Pseudo functions. Data Preparation: Rock, fluid, mechanical, production and validation

UNIT – 3 **10 L**

Solution Techniques: Analytical and numerical methods, explicit and implicit methods of discretization, finite-difference and finite element method, linearization, solution of simultaneous equations.

UNIT – 4 **8 L**

Stability criteria, Iterative methods, IMPES & IMPIS methods. Numerical dispersion. Grid and time step size selection. History matching: Manual and automated system Reservoir performance using simulation approach.

UNIT – 5 **10 L**

Simulating special processes: Compositional simulation, Miscible displacement, chemical and polymer flooding, thermal recovery processes.

Books:

1. Basic Applied Reservoir Simulation by T. Ertenim, J.H Abou-kassem and G.R. King, SPE Text book series.
2. Notes on reservoir simulation, Institute of Petroleum Engineering, Herriot-watt University.
3. Principles of Applied Reservoir Simulation, byJ.R.Fanchi, Gulf Publication.

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Off-Shore Drilling & Production Practices**	Course Code: **MA7030**
Credit: 3.5	L **3** T **1** P **0**
Year: **4th**	Semester: **VII**

UNIT – 1 **6 L**

Sea states and weather: Meteorology, oceanography. Sea-bed soil condition. wave condition. Wave-structure interaction.

UNIT – 2 **8 L**

Off-shore structures: Fixed platform, jack-up rig: design and operational features mobile units; semi-submersible, floating structures, description and installation, station keeping, mooring and dynamic positioning system.

UNIT – 3 **8 L**

Off-shore drilling: Well head and sea floor connection; conductor and riser. Off-shore well completion: Platform and subsea completion system, well control and work-over system.

UNIT – 4 **8 L**

Sub-sea technology in deep water – use of divers and robots. Off-shore production: Platform oil and gas processing, water and gas injection system.

UNIT – 5 **10 L**

Storage for oil; SPM & SBM system. Deep water technology: use of remote operating vehicle (ROV).

Books:

1. Offshore Structures: Design Construction and Maintenance, Mohamed A El-Reedy, Gulf professional Publication
2. Handbook of Offshore Engineering Volume I and II, Elsevier, 2006, 1213 pp. by Chakraborty S.K.

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Well Simulation**	Course Code: **MA7040**
Credit: 3.5	L T P **3 1 0**
Year: **4th**	Semester: **VII**

UNIT – 1 **8 L**

Chemical Properties of Oil-bearing formations and fluids; Rock composition & mineralogy, clays, surface charge, charge exchange capacity, formation water, crude oils.

UNIT – 1 **8 L**

Physical properties of formation materials: Mechanical properties and Thermal properties.
Chemical and Mechanical properties of injected fluids: polymer solution. Entry hole dia. Perforating for Hydraulic fracturing.

UNIT – 1 **8 L**

Hydraulic Fracturing: Dynamic fracture Geometry: Orientation, vertical, horizontal and penny-shaped. Fluid loss, fracture conductivity. Proppant fracturing, Acid fracturing.

UNIT – 1 **10 L**

Well Productivity; design and optimization of fracturing processes. Acidization: Methods, Rates of reaction, Sand Stone Acidization. Design consideration in Matrix acidizing.

UNIT – 1 **6 L**

Designing Matrix acidizing in carbonates. Acid additives. Sand Control: Gravel Packing. Sand consolidation.

Books:

1. Well completion and servicing , D. Perrin
2. Reservoir stimulation by Ahmed S. Abou-Sayed
3. Petroleum Production systems by Michael J. Economides, A Daniel Hill & Christine Ehlig Economides Prentice Hall Publication

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Non-Conventional Petroleum Resources (*Elective–I*)**	Course Code: **MA7610**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VII**

UNIT – 1 **10L**

Introduction and present status of coal bed methane. Formation and properties of coal bed methane. Thermodynamics of coal bed methane. Drilling, completion and logging of coal bed methane wells.

UNIT – 2 **8L**

Hydro-fracturing of coal bed methaneseam. Production, installation and surface facilities. Well operation and production equipments. Treating and disposing produced water. Testing of coal bed methane wells.

UNIT – 3 **10L**

Introduction and present status of gas hydrates. Formation and properties of gas hydrates. Thermodynamics of gas hydrates. Phase behavior of gas hydrates. Kinetics of gas hydrates. Drilling and completion of gas hydrates wells. Prevention and control of gas hydrates.

UNIT – 4 **6L**

Gas hydrates accumulation in porous media. Gas extraction from gas hydrates. Uses and applications of gas hydrates.

UNIT – 5 **8L**

Introduction and present status of shale gas. Formation and properties of shale gas. Drilling and completion of shale gas. Uses and applications of shale gas. Prevention and control of shale gas. Environmental issues in shale gas exploration. Future prospects of shale gas

Books:

1. Coal Bed Reservoir Gas –in Place Analysis; Matt Mavor, Charles R. Nelson; Gas Research Institute.
2. A guide to Coal Bed Methane Reservoir Engineering; Jerrald L. Saulsberry; Paul S. Schafer; Gas Research Institute

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Material Technology(*Elective–I*)**			Course Code: **MA7620**
Credit: 3.5	L	T	P
	3	**1**	**0**
Year: **4th**			Semester: **VII**

UNIT – 1 **6L**

Properties and behavior of materials useful in structure, machines and equipments, atomic arrangements and imperfections elasticity, micro elasticity and phase transformation. Theories of corrosion and corrosion and method of corrosion control.

UNIT – 2 **8L**

Theory of alloying, constitutional diagrams, their construction and applications. Cast iron as material of construction with reference to its application, selection of material, general criterion of selection of material of construction in process industries.

UNIT – 3 **10L**

Materials of construction and their technology with reference to application in industry mild steel, high carbon steel, stainless steel, high silicon steel, molybdenum and tungsten steel, heat treatment of plane steel.

UNIT – 4 **6L**

Nonferrous metals – copper, aluminum, lead, chromium, tin, brass, bronze and monel

UNIT – 5 **8L**

Non-metals – Glass, Enamels, graphite, wood, plastics, rubber, ebonite lining materials, composite materials: fiber reinforced plastic composite material, concrete, asphalt and asphalt mixture, ceramic mixture and silicates, structure and properties, polymeric material.

Books:

1. Material Science and Technology; John Willy.
2. Engineering Materials Technology; James A. Jacobs.

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Polymer Technology (*Elective – I*)**	Course Code: **MA7630**
Credit: 3.5	L T P **3 1 0**
Year: **4th**	Semester: **VII**

UNIT – 1 **6L**

Introduction to polymer science Classification of polymer structure Molecular weight, Chemical structure & Thermal transition.

UNIT – 2 **8L**

The synthesis of high polymers Step-growth polymerization. Chain growthpolymerization. Polymerization techniques, Reactions of synthetic polymers, special topics in polymer, synthesis, Chemical structure determination.

UNIT – 3 **10L**

Solution & solid-state properties, Viscosity & Rubber elasticity.

UNIT – 4 **6L**

Degradation, stability & environmental issues, polymer additives, blends & composites.

UNIT – 5 **8L**

Commodity thermoplastics &fitherselastolmers& thermosets engineering &speciality polymers.

Books:

1. Ebewele Outlines of Polmer Technology; R. Sinha.
2. Polymer Science and Technology; P. Ghosh.

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Directional Drilling (*Elective – I*)**	Course Code: **MA7640**
Credit: 3.5	L T P **3 1 0**
Year: **4th**	Semester: **VII**

UNIT – 1 **6L**

Objectives, Types of deflection tools, tool orientation, Directional well profiles, Well path deflection & correction.

UNIT – 2 **8L**

Positive displacement motors and Turbo-drills - motor description, Power calculation and applications. Auto-track and verti-track system. Rotary Steerable motors, Geo-steering tools.

UNIT – 3 **8L**

Horizontal well objectives and selection, Different profiles, Drilling techniques, Mud requirements & characteristics, casing and drill string requirements and completion programs.

UNIT – 4 **8L**

Slant Hole Drilling: Objectives and selections, Well profiles and applications. Down the Hole Well Surveying:Well surveying objectives, surveying methods, Surveying Analysis methods and calculations for well coordinates.

UNIT – 5 **10L**

Objectives of MWD/ LWD, MWD tools, Telemetry system and data interpretation. Directional Drilling Problems and Their Remedies.

Books:

1. Introduction to Directional Drilling; Raymond de Verteuil and Iain McCourt; Schlumberger.
2. Drilling Engineering-A complete well planning approach; Neal J. Adams; PennWell publishing Company; Tulsa, Okhlama.
3. Well Engineering and Construction; HussanRabia.

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Natural Gas Engineering**	Course Code: **MA8010**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VIII**

UNIT – 1 **6L**

Natural Gas industry: Size and direction of development. Physical properties of natural gas and associated gas; compressibility; thermal properties.

UNIT – 2 **6L**

Flow of gas in well tubing. Pws, Pwf, Pwh equations. Gas flow measurement: orifice meter, turbine meter, principles and performance.

UNIT – 3 **10L**

Natural Gas processing: Free-liquid removal, low temperature separation, Dehydration process: chemical and refrigeration system.

UNIT – 4 **10L**

Natural Gas sweetening: Amine process, sulphur recovery, LPG, CNG production. Natural Gas liquefaction (NGL): Process, system, storage, transportation and utilization.

UNIT – 5 **8L**

Underground storage; system and production performance. Special problems: Natural gas hydrates. CBM, in-situ coal gasification.

Books:

1. Fundamentals of Natural Gas Processing; L.L.Faulkner. Natural Gas Engineering Handbook; Guo and Ghalambor.
2. Fundamentals of Natural Gas Processing; L.L.Faulkner.
3. Natural Gas Engineering Handbook; Guo and Ghalambor.

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Oil and Gas Transportation System**	Course Code: **MA8020**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VIII**

UNIT – 1 **6L**

Road and rail transport of crude oil & product. Tanker design, safety features.
Oceanic transport of oil and liquefied natural gas: design of ocean going tankers and safety features.

UNIT – 2 **8L**

Pipe line transport of oil and gas: Route selection, pipe line construction process and equipment: trenching, aligning, connecting pipes, corrosion protection, lowering & back filling.

UNIT – 3 **8L**

Flow of oil and gas through pipelines. Pressure drop calculation, types, sizing and location of pumps and compressor. Instrumentation and control.

UNIT – 4 **8L**

Flow measurement and control arrangement. Corrosion in pipelines: Types, chemical and electro-chemical process; coating, cathodic protection principle and design.

UNIT – 5 **10L**

Pipe line branching: Gas distribution control. Offshore pipe line: Sag and overbend; stinger and riser, under-water welding.

Books:

1. Pipeline engineering by Henry Liu, Lewis Publishers Washington, D.C.
2. Piping and pipeline engineering, George A. Antaki, Marcel Dekker Inc. New York
3. Fundamentals of pipeline engineering by J. Vincent Genod, Technip Editions.

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Enhanced Oil Recovery Techniques**	Course Code: **MA8030**
Credit: 3.5	L T P **3 1 0**
Year: **4th**	Semester: **VIII**

UNIT – 1 **6L**

Principles and Mechanism. Screening criteria, Macroscopic displacement of fluids: Areal sweep efficiency. Vertical sweep efficiency Displacement efficiency, mobility ratio, well spacing.

UNIT – 2 **8L**

Water flooding in reservoir: Equation of motion. Continuity, solution methods, Pattern flooding, recovery etc., permeability heterogeneity.

UNIT – 3 **10L**

Chemical flooding: Polymer flood; mobility control in-situ permeability modification, foam flooding; WAG process. Surfactant flooding, miscellar/polymer flooding, micro emulation phase behavior, wettability modification, Alkaline flooding.

UNIT – 4 **8L**

Miscible displacement processes – miscibility condition, high pressure gas injection, enriched gas injection, LPG flooding, carbon dioxide flooding, alcohol flooding.

UNIT – 5 **8L**

Thermal Recovery processes: Hot water flooding, steam flooding, cyclic steam injection, in-situ combustion, air requirement; combustion front monitoring, microbial oil recovery.

Books:

1. Bradley H B, Petroleum Engineering Handbook, third edition, SPE, 1992.
2. Lake L., "Enhanced Oil Recovery"
3. Green D W and Willhite G P, "Enhanced Oil Recovery", SPE, 2003, 556 pp
4. Enhanced Oil Recovery; Teknica; Teknica Petroleum Services Ltd.; Calagry, Alberta.

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Health, Safety and Environmental Management in Petroleum Operations (*Elective–II*)**		Course Code: **MA8610**
Credit: 3.5	L **3**	T **1**	P **0**
Year: **4th**		Semester: **VIII**

UNIT – 1 **8L**

Health hazard:Toxicity, physiological, asphyxiation, respiration and skin effects. Effect of sour gases (H_2S and CO) on human health. Effect of corrosive material and atmosphere during sand control, fracturing and acidization operations.

UNIT – 2 **10L**

Safety analysis**:** Operational risk in drilling, production and handling of oil and gas, fire hazard: safety system in drilling, production operations. Manual and automatic shutdown systems, blow down systems. Gas leakage, fire detection and suppression systems.Hazard and failure mode analysis: safety analysis: disaster and crisis management.

UNIT – 3 **8L**

Environment Health and Safety Management. Impact of oil and gas on air, water and soil pollution, impact of drilling and production operations, offshore problems, oil-spill control. Environmental impact assessment. Waste treatment & management methods, effluent water treatment and disposal. Contaminated soil remediation.

UNIT – 4 **8L**

Noise pollution and remediation measure. Industrial Accident & Prevention: Safety sampling, Accident and Safety Audit; Legal requirements, Disaster Planning and control. Safety in offshore operations.

UNIT – 5 **8L**

Gas detection, fire detection and suppression, personal protection measures. Occupational Physiology: Respiratory and skin effect. HSE regulations; oil mines regulations.

Books:

1. OrzuOrszulik, "Environmental Technology in oil Industry", Springer –Verlag, 1996.
2. Reis, J.C., "Environmental control in Petroleum Engineering", Gulf publications.1998.
3. Boyce, A., "Introduction to Environmental Technology", John Wiley and Sons, 1996

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Oil & Gas Marketing and Resource Management** (***Elective–II***)		Course Code: **MA8620**
Credit: 3.5	L **3**	T **1**	P **0**
Year: **4th**		Semester: **VIII**

UNIT – 1 **8L**

Introduction: The development of Oil & Gas Industry, Structure of Oil & Gas Industry, Introduction to Indian Oil & Gas Industry, India hydrocarbon vision 2050. Petroleum resource classification, Analysis of resource management.

UNIT – 2 **8L**

Natural Gas: What is Natural Gas, Measuring Natural Gas, Pipeline quality Natural Gas. Demand, Supply & Storage of Natural Gas: Gas Production, Sources of demand in India, Supply system, Pipeline operations & network, Storage of Natural Gas, Liquefied Natural Gas Plant & Operations, Gas Scale pattern in India, Gas regulations in India, Gas trading, gas pricing.

UNIT – 3 **8L**

Coal Bed Methane: Introduction, Present status of Coal Bed Methane, CBM storage and scale, CBM pricing in India. Crude Oil: Crude oil specification, measuring/Custody transfer of crude Oil, Crude Oil transportation, Crude Oil production in Indi, Crude Oil Refineries, products from Crude Oil.

UNIT – 4 **8L**

International & National Institutions of Oil & Gas: OPEC, OECD, OIDB, DGH, PNGRB, CHT, PII, PPAC, PCRA. Petroleum Contracts: NEPL- Role & Background, Types of Contracts and fiscal components, production sharing contracts in India, Crude Oil trading and pricing, CBM Contracts and Shale Gas Contracts.

UNIT – 5 **8L**

Trade Practices & Taxation: Norms on various trade practices, Elements of Petroleum Development Policy, Financial and taxation issues.

Risk Management: source of risk, managing risks by risk reduction, diversification, and uncertainty and decision analysis by decision tree.

Books:

1. Petroleum Economics and Engineering by Abdel A. A., Bakr A. B, and Al Sahlawi M. A**.,** Decker Publications, 1992
2. IFP, Oil and Gas Exploration and Product ion, Reserves, Costs and Contracts. Technip Publication 2007.336 pp.
3. Petroleum Exploration and Production Rights by SilvanaTordo and D Johnston, World Bank Working Paper 179, Washington, 2010.

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Fuel Technology (*Elective–II*)**	Course Code: **MA8630**
Credit: 3.5	L T P **3 1 0**
Year: **4th**	Semester: **VIII**

UNIT – 1 **10L**

Classification of Fuel- Solid Fuels, Liquid Fuels, Gaseous Fuels. Various Terms Related to the Study of Fuels and Combustion. Coal-Origin, Composition, Petrography. Analysis and Properties of Coal. Classification of coal.

UNIT – 2 **8L**

Coal Preparation, Coal Storage, Coal Carbonization and by-product Recovery. Physical and Chemical Properties of Coke. Briquetting of Solid Fuels. Liquefaction of Solid Fuels.

UNIT – 3 **10L**

Coal: A Source of Energy- Gasification of Coal. Fixed Bed Gasification, Fluidized Bed Gasification, Entrained Bed Gasification. Integrated Gasification Combined Cycle (IGCC).Underground Gasification of Coal. Indian Scenario related to Coal Gasification. Coal to Liquid (CTL) via Fischer – Tropsch (F-T) Synthesis.

UNIT – 4 **6L**

Gaseous and Liquid Fuels- Natural gas, Producer gas, Water gas, Carbureted Water gas, Coal gas, Gases from biomass, LPG. Gasoline, Kerosene, Diesel. Physico–Chemical Properties and Testing of Liquid Fuels. Coal Tar Fuels (CTF).

UNIT – 5 **8L**

Combustion: General Principle of Combustion. Combustion of Solid Fuels – Grate Firing nd Pulverized Fuel Firing System. Combustion of Liquid Fuels. Burners for Liquid and Gaseous Fuels Combustion.

Books:

1.Kuo, K.K., Principles of Combustion, John Wiley and Sons, Inc. (2005).
2.Sarkar, S., Fuels and Combustion, Orient Longman, (1990).
3.Sharma, S.P., and Chander, M., Fuels and Combustion, Tata Mcgraw Hill (1984).

Department of Petroleum Engineering
Course Structure of B.Tech. (PE)
Batch: 2016-20

Course Title: **Carbon Capture and Sequestration (*Elective–II*)**	Course Code: **MA8640**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VIII**

UNIT – 1 **6L**

Introduction: Scope, Objectives and Necessity of CCS

UNIT – 2 **8L**

The contribution of fossil fuels emission to Climate change and global warming. Concept of Carbon Credit and carbon footprint.

UNIT – 3 **6L**

Carbon capture techniques: Carbon-di-oxide emission, Scrubbing of CO2, Carbon dioxide recycling

UNIT – 4 **10L**

Carbon dioxide sequestration: Underground storage, Potential for Geologic Storage, Application in Oil and gas industry, Carbon di oxide flooding projects, Methane recovery projects.

UNIT – 5 **8L**

Strategy for implementing CCS technology: Modelling of Cost and Performance of CCS Plants. Role and function of IPCC

Books:

1. Carbon Capture; Jennifer Wilcox; Springer
2. Capturing Carbon – The new weapon in the War Against Climate Change; Mills, Robin M.; Columbia University Press.

Course Structure & Syllabus of
Open Electives
Applicable for 2016-2020 Batch

DIT UNIVERSITY
Dehradun

Course Structure & Detailed Syllabus of

Open Electives offered in B.Tech 2016-2020

Course Structure & Syllabus of
Open Electives
Applicable for 2016-2020 Batch

Course Structure

List of Open Electives (To be conducted in VIII Semester)

Sl. No.	Branch	Subject Code	Name of Elective subjects	Credit
1	Physics	OA8710 OA8720	1. Nano Scale Science and Technology 2. Photonics Technology	3
2	EE	EA8710 EA8720	1. Non-Conventional Energy Resources 2. Instrumentation and Process control	3
3	ME	LA8710 LA8720	1. Entrepreneurship development 2. Quality Management	3
4	Civil	CA8710 CA8720	1. Environment and Ecology 2. GIS	3
5	CSE	DA8740 DA8710	1. Management Information System (MIS) 2. Business Intelligence	3
6	IT	IA8730 IA8721	1. Internet of Things 2. IT In Business	3
7	ECE	FA8710	1. Consumer Electronics	3
8	Humanities	HA8710 HA8720	1. Industrial Psychology 2. Human Values and Ethics	3
9	MBA	GA8710 GA8730 GA8740	1. Organizational Behavior 2. Digital Marketing 3. Financial Modeling with Spread sheet	3

Course Structure & Syllabus of
Open Electives
Applicable for 2016-2020 Batch

Course Title: **Nano Scale Science and Technology**			Course Code: **OA8710**
Credit: 3	L **3**	T **0**	P **0**
Year: **4th**			Semester: **VIII**

UNIT 1

Historical perspective of nano science and technology, types of nanotechnology and Nano machines, top-down and bottom-up techniques, molecular nanotechnology, atomic manipulations – nano dots, self-assembly, dip pen nanolithography, simple details of characterization tools – SEM, TEM, STM, AFM.

UNIT 2

Nano materials: preparation of nano-materials, PVD, CVD, sol-gel techniques, electro deposition, ball milling, natural nano-materials, application of nanomaterials – insulating materials, machine tools, polymers, batteries, high power magnets and medical implants.

UNIT 3

New form of carbon, carbon nanotubes, single walled carbon nanotubes (SWNTs), multiple walled carbon nanotubes (MWNTs), graphenes, fullerenes, nano wires and nano rods (fabrication methods and their applications).

UNIT 4

Nanophotonics and solar energy: Metamaterials & Plasmonics, Photonic crystals, Silicon photonics and Photovoltiacs.

UNIT 5

Nanofabrication: Introduction, tools of micro and nano fabrication, optical and electron beam lithography, molecular beam lithography, quantum electronic devices, simple ideas about Nano computers.

Applications: Micro Electro Mechanical system (MEM), Nano Electro Mechanical system (NEM), Robots, Nanomachines.

References

1. Introduction to nanotechnology, Charles P. Poole Jr. and Frank J. Owens, Wiley Intersciences, 2003
2. Nanotechnology: Basic Science and Emerging Technologies, Mick Wilson, Kamali Kannagara, Geoff Smith, Overseas Press, 2005
3. Nanotechnology – A Gentle Introduction to the Next Big Idea, Mark Ratner and Daniel Ratner, Prentice Hall, 2002
4. Nano : The Essentials, Understanding of Nanoscience and Nanotechnology, T. Pradeep, Tata McGraw Hill, 2007
5. Nanotechnology, Jeremy Ramsden, Ventus Publishing ApS (download from http//bookboon.com/us/student/chemistry)
6. Nanotechnology: Concepts, Application and Perspectives, C.M. Niemeyer and C.A. Mirkin, Wiley-VCH, 2004
7. Physics of Semiconductor Nano Structures, K.P. Jain, Narosa Publishers, 1997
8. Nanotechnology : Technology Revolution of 21st Century, Rakesh Rathi, S.Chand, 2009

Course Structure & Syllabus of
Open Electives
Applicable for 2016-2020 Batch

Course Title: **Photonics Technology**			Course Code: **OA8720**
Credit: 3	L **3**	T **0**	P **0**
Year: **4th**			Semester: **VIII**

Unit I: Integrated Optics

Step-index and graded-index waveguides, guided and radiation modes. Strip and channel waveguides, electro-optic waveguide devices. Directional couplers, optical switch; phase and amplitude modulators, filters, etc.

Unit II: Fiber Optics

Introduction, The optical fiber, the numerical aperture, Step and graded index multimode fibers, Pulse dispersion in step index fibers, Scalar wave equation and modes of a fiber, Multimode fibers, Single mode fibers, Splice loss etc.

Unit III: Nonlinear Optics

Introduction, Self focusing phenomenon, simple SHG, Nonlinear frequency up conversion, Single-pass SHG and SFG, Resonator-enhanced SHG, parametric amplification and SFG.

Unit IV: Fabrication of Photonic Devices

Material selection for various applications, Fabrication of integrated optical waveguides and devices. Waveguide characterization, end-fire and prism coupling; grating and tapered couplers. Fabrication techniques for various kinds of Photonic structures, such as Waveguide structures.

Recommended Books:

- Ajoy Ghatak &, K. Thyagarajan, "Optical Electronics", Cambridge University Press
- A.K.Ghatak & K.Thyagarajan, "Introduction to Fiber Optics", Cambridge University Press.
- M. J. Adams, "An Introduction to Optical Wave guides", John Wiley & Sons.
- Hiroshi Nishihara, Masamitsu Haruna, "Optical Integrated Circuits", McGraw Hill Professional.
- William P Risk, Timothy R. Gishell, "Compact Blue-Green Lasers", Cambridge Univ. Press.
- Saleh & Tiech, "Fundamentals Of Photonics"**,** (2012), John Wiley, New York.
- B.B. Laud, "Non-Linear Optics",
- Vijayan (IIT Madras), Non-Linear Optics

Course Structure & Syllabus of
Open Electives
Applicable for 2016-2020 Batch

Course Title: **Non-Conventional Energy Resources**			Course Code: **EA8710**
Credit: **3**	L **3**	T **0**	P **0**
Year: **4th**			Semester: **VIII**

Unit I: Introduction Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits, present energy scenario.

Unit II: Solar Cells - Theory of solar cells. Solar cell materials, solar cell power plant, limitations. Solar Thermal Energy Solar radiation flat plate collectors and their materials, applications and performance, focusing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

Unit III: Geothermal Energy - Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations.
Magneto-hydrodynamics (MHD) Principle of working of MHD Power plant, performance and limitations.

Unit IV: Fuel Cells - Principle of working of various types of fuel cells and their working, performance and limitations. Thermo-electrical and thermionic conversions, Principle of working, performance and limitations.
Wind Energy: Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. Performance and limitations of energy conversion systems.

Unit V: Bio-mass - Availability of bio-mass and its conversion theory.
Ocean Thermal Energy Conversion (OTEC) - Availability, theory and working principle, performance and limitations.
Wave and Tidal Wave - Principle of working, performance and limitations. Waste Recycling Plants

Text Books:

1. D.S. Chauhan, "Non-Conventional Energy Resources", New Age International
2. B.H. Khan, "Non-Conventional Energy Resources", Tata McGraw Hill

Reference Books:

1. Andra Gabdel, "A Handbook for Engineers and Economists".
2. A. Mani, "Handbook of Solar radiation Data for India".
3. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.
4. F.R. the MITTRE, "Wind Machines" by Energy Resources and Environmental Series.
5. Frank Kreith, "Solar Energy Hand Book".
6. N. Chermisinogg and Thomes, C. Regin, "Principles and Application of Solar Energy".
7. N.G. Calvert, "Wind Power Principles".
8. W. Palz., P. Chartier and D.O. Hall," Energy from Biomass".

Course Structure & Syllabus of
Open Electives
Applicable for 2016-2020 Batch

Course Title: **Instrumentation and Process control**			Course Code: **EA8720**
Credit: **3**	L **3**	T **0**	P **0**
Year: **4th**			Semester: **VIII**

UNIT – 1
Transducer – I
Definition, advantages of electrical transducers, classification, characteristics, factors affecting the choice of transducers, Potentiometers, Strain guages, Resistance thermometer, Thermistors, Thermocouples, LVDT, RVDT

UNIT – 2
Transducer – II
Capacitive, Piezoelectric Hall effect and opto electronic transducers. Measurement of Motion, Force pressure, temperature, flow and liquid level.

UNIT – 3
Telemetry
General telemetry system, land line & radio frequency telemetering system, transmission channels and media, receiver & transmitter. Data Acquisition System: Analog data acquisition system, Digital data acquisition system, Modern digital data acquisition system.

UNIT – 4
Display Devices and Recorders
Display devices, storage oscilloscope, spectrum analyzer, strip chart & x-y recorders, magnetic tape & digital tape recorders.
Recent Developments: Computer aided measurements, fibre optic transducers, microsessors, smart sensors, smart transmitters.

UNIT – 5
Process Control
Principle, elements of process control system, process characteristics, proportional (P), integral (I), Derivative (D), PI, PD and PID control modes. Electronic, Pneumatic & digital controllers.

Text Books:
1. A.K.Sawhney, "Advanced Measurements & Instrumentation", DhanpatRai& Sons
2. B.C. Nakra&K.Chaudhry, "Instrumentation, Measurement and Analysis", Tata McGraw Hill 2nd Edition.
3. Curtis Johns, "Process Control Instrumentation Technology", Prentice Hall

Reference Books:
4. E.O. Decblin, "Measurement System – Application & design", McGraw Hill.
5. W.D. Cooper and A.P. Beltried, "Electronics Instrumentation and Measurement Techniques", Prentice Hall International
6. RajendraPrasad, "Electronic Measurement and Instrumentation Khanna Publisher
7. M.M.S. Anand, "Electronic Instruments and Instrumentation Technology" PHI Learning.

Course Structure & Syllabus of
Open Electives
Applicable for 2016-2020 Batch

Course Title: **Entrepreneurship Development**			Course Code: **LA8710**
Credit: **3**	L **3**	T **0**	P **0**
Year: **4th**			Semester: **VIII**

Unit-I

Entrepreneurship- definition. Growth of small-scale industries in developing countries and their positions vis-a-vis large industries; role of small-scale industries in the national economy; characteristics and types of small-scale industries; demand based and resources-based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small-scale industry.

7

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods. **8**

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.

9

UNIT -IV

Project Planning and control:

The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. Profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication.

9

UNIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.

7

Text / Reference Books:

1. Forbat, John, “Entrepreneurship” New Age International.
2. Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International
3. Joseph, L. Massod, “Essential of Management", Prentice Hall of India.

Course Structure & Syllabus of
Open Electives
Applicable for 2016-2020 Batch

Course Title: **Quality Management**			Course Code: **LA8720**
Credit: **3**	L **3**	T **0**	P **0**
Year: **4th**			Semester: **VIII**

Unit - I

Introduction: Need for quality, Evolution of quality, Definition of quality, Dimensions of manufacturing and service quality, Basic concepts of TQM, Definition of TQM, TQM Framework, Contributions of Deming, Juran and Crosby, Barriers to TQM.

Unit – II

Process Control & Product Control, Concept of control charts, variables & attributes control chart for variables & attributes Acceptance Sampling and Sample Plans

Unit - III

Concept of reliability, maintainability and availability. Bath tub curve, MTTF, MTTR, Zero Defect

Unit - IV

The seven traditional tools of quality, New management tools, Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT, Bench marking. Reason to bench mark, Bench marking process, FMEA, Stages, Types. Deming Cycle, 5S Techniques, Kaizen

Unit - V

Quality circles, Quality Function Deployment (QFD), Taguchi quality loss function, TPM – Concepts, Concept of Cost of Quality

Text Book:

1. Dale H. Besterfiled, et at., "Total Quality Management", Pearson Education Asia, Third Edition, Indian Reprint (2006).

Reference Books:

1. Quality Management by Kanishka Bedi -Oxford University press First Edition 2008

2. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 6th Edition, South-Western (Thomson Learning), 2005.

3. Oakland, J.S. "TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, 3rd Edition, 2003.

4. Suganthi, L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd.,2006.

5. Janakiraman, B and Gopal, R.K, "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.

6. Total Quality Management by Shri Dhara Bhatt K.

Course Structure & Syllabus of
Open Electives
Applicable for 2016-2020 Batch

Course Title: **Environment & Ecology**			Course Code: C**A8710**
Credit: **3**	L **3**	T **0**	P **0**
Year: **4th**			Semester: **VIII**

Unit I

Environment

Environment and its components, pollution of environment by human activity, kinds of pollution.

Unit II

Water Quality

Measure of water quality, water quality standards, water treatment; waste water transport and treatment, sludge treatment and disposal.

Air Quality

Sources and effects of air pollution, major air pollutants, air quality control, treatment of emissions, dispersion of air pollutants.

Unit III

Solid waste

Collection of refuse, removal and transport, disposal of refuse.

Noise Pollution

Effect of noise on human health and its control.

Unit IV

Ecology

Ecology and Ecosystems, concept of ecological imbalances, physical and climate factors, biotic components, energy and material flows in ecosystems, human influence on ecosystems.

Unit V

Conservation of Natural Resources

water resources, mineral resources, agricultural and forestry resources, agriculture soil and need of nutrients, fertilizers and pesticides. Brief introduction about environmental legislation and environmental
audit.

Books Recommended:

1. Vesilind, " Introduction to Environmental Engineering," Thomson Asia Pvt. Ltd. Singapore.

Course Structure & Syllabus of
Open Electives
Applicable for 2016-2020 Batch

Course Title: **GIS**			Course Code: C**A8720**
Credit: **3**	L **3**	T **0**	P **0**
Year: **4th**			Semester: **VIII**

Unit I

Definition of GIS, Cartography and GIS, GIS database: spatial and attribute date; Spatial models: Semantics, spatial information, temporal information, conceptual models of spatial information, representation of geographic information: point, line and area futures, topology,

Unit II

Raster and vector data, raster to vector data conversion, map projection, analytical transformation, rubber sheet transformation, manual digitizing and semi-automatic line following digitizer; Remote sensing data as an input to GIS data;

Unit III

Attribute database: scale and source of inaccuracy; GIS functionality; data storage and data retrieval through query, generalization, classification, containment search within a spatial region;

Unit IV

Overlay: arithmetical, logical and conditional overlay, buffers, inter visibility, aggregation; Network analysis;

Unit V

Applications of GIS in planning and management of utility lines and in the filed of environmental engineering, geotechnical engineering, transportation engineering and water resources engineering.

Books Recommended:

1. Geographic Information Systems: A Management Perspective, by Stan Arnoff, WDL Publications.
2. Fundamentals of Spatial Information Systems by Robert laurini and Derek Thompson, Academic Press.
3. Geographical Information Systems, Vo. I and II edited by Paul Longely, M.F. Goodchild, et.al, John Wiley and Sons, Inc. 1999

Course Structure & Syllabus of
Open Electives
Applicable for 2016-2020 Batch

Course Title: **Business Intelligence**			Course Code: **DA8710**
Credit: 3	L	T	P
	3	**0**	**0**
Year: **4th**			Semester: **VIII**

UNIT I: **(8 L)**

Introduction to Business Intelligence:

Introduction to OLTP and OLAP, BI Definitions & Concepts, Business Applications of BI, BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities

UNI -II: **(8 L)**

Basics of Data Integration (**E**xtraction **T**ransformation **L**oading)**:**

Concepts of data integration need and advantages of using data integration, introduction to common data integration approaches, introduction to ETL using SSIS, Introduction to data quality, data profiling concepts and application

UNIT-III: **(8 L)**

Introduction to Multi-Dimensional Data Modeling**,**

Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi-dimensional modeling, concepts of dimensions, facts, cubes, attribute, hierarchies,

UNIT –IV: **(8 L)**

Star and snowflake schema, introduction to business metrics and KPIs, creating cubes using SSAS

Unit V: **(8 L)**

Basics of Enterprise Reporting**:**

Introduction to enterprise reporting, concepts of dashboards, balanced scorecards, introduction to SSRS Architecture, enterprise reporting using SSRS

Courseware & Reference Books:

The courseware including PowerPoint and notes are available for the Elective. In addition, following reference books can also be used:

1. Business Intelligence by David Loshin
2. Business intelligence for the enterprise by Mike Biere
3. Business intelligence roadmap by Larissa Terpeluk Moss, ShakuAtre
4. Successful Business Intelligence: Secrets to making Killer BI Applications by CindiHowson
5. Delivering business intelligence with Microsoft SQL server 2008 by Brain, Larson
6. Foundations of SQL Server 2005 Business Intelligence by Lynn Langit
7. Information dashboard design by Stephen Few

Course Structure & Syllabus of
Open Electives
Applicable for 2016-2020 Batch

Course Title: **Management Information System (MIS)**	Course Code: **DA8740**
Credit: 3	L: **3** T: **0** P: **0**
Year: **4th**	Semester: **VIII**

Course Structure & Syllabus of
Open Electives
Applicable for 2016-2020 Batch

Course Title: **Internet of Things**			Course Code: **IA8730**
Credit: 3	L **3**	T **0**	P **0**
Year: **4th**			Semester: **VIII**

UNIT 1 **5L**

M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics.

UNIT 2 **10L**

M2M to IoT – A Market Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

IOT related open source software tools introduction; tools like IoTivity, IBM Blue Mix. Introduction to Contiki, Cooja, Rasbari Pi etc..

UNIT 3 **5L**

M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management

UNIT 4 **12L**

IoT Architecture-State of the Art – Introduction, State of the art, Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model

IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

UNIT 5 **8L**

Industrial Automation- Service-oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things, **Commercial Building Automation-** Introduction, Case study: phase one-commercial building automation today, Case study: phase two- commercial building automation in the future.

Textbook:

- Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence**",** 1st Edition, Academic Press, 2014.

Reference Books:

- Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
- Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013

Course Structure & Syllabus of
Open Electives
Applicable for 2016-2020 Batch

Course Title: **IT in Business**	Course Code: **IA8721**
	L T P
Credit: 3	**3 0 0**
Year: **4th**	Semester: **VIII**

UNIT – 1

Business Drivers, IT's Competitive Potential Strategic, Alignment Strategic Management and Competitive Strategy ; Enterprise-wide and Inter-Organizational System, Information System Architecture, Legacy System ; Business Driven IT Infrastructure, BPR (Business Process Re-engineering), Business Resources and International Issues; IT Environment Values Resources (EVR), Strategic Management and its role in IT, Customer Matrix and Producer Matrix , Planning for Competitive Advantage ; Software Agents, Intelligent Agents, Traditional Computing Environment;

UNIT – 2

Rethinking Business through IT, Developing a Competitive Strategy, Inter-organization Information; E-Commerce and Electronic Markets- Inter-Organizational Information System and Transactions, Success Factor in E-Commerce; E-Business- Infrastructure, Hardware, Network; Business-To-Business Systems, Electronic Commerce and Market Systems; EDI-Electronic Data Interchange, Elements of EDI, Benefits, Applications; Electronic Commerce Payment Mechanism-Magnetic Strip Card, Smart Card, E-Cash, E-Wallets, IMPS, UPI, NACH .

UNIT – 3

Forming a Corporate IT Strategy, Information Economy, Decision making process; Corporate IT Strategy ,Management in Technological Environment, Competitive Strategy, Framework for Strategic use of IT; Developing an Information Architecture, Information Architecture, B2B System-Characteristics, Models, IT Solutions, Three pillars of E-Commerce ;Capitalizing of Information Technology, IBM's E-Business Strategy.

UNIT – 4

Incorporating Business Innovation into the Corporate IT Strategy, Impact of IT globalization in Software Industry, International IT Business Strategy; Global Strategic Management in IT, Application, Data Issues, System Development, IT Management in Business; Implementing Business Change with IT, Changing Role of IT in International business, The Changing Global IT Practices, Conversion Methods, Information System Maintenance .

UNIT – 5

The Impact and value of Information Technology in Competitive Strategy, Benefits of IT- Cost, Revenues, Profits, Quality, Opportunities; Organizational Technology Flexibility, Social Responsibilities in IT, Ethics in IT industry; Future of IT- Multimedia, Hardware, Virtual Reality, Digital System; Maximize the utilization of IT, Use of Accessible Technology to a Wider Audience of Computer, Changing the Focus of Strategy Trends: Beyond 2000

Recommended Books:

1. Callon, Jack D., ―Competitive Advantage Through Information Technology‖, McGraw Hill, 2014
2. Tapscott, Don, ―The Digital Economy‖, McGraw-Hill, 2013. [DIGITAL]
3. S.Verma, S.K.Shukla,- IT in Business , Dhanpat Rai & Co, 2014
4. Turban, E., McLean, E. and Wetherbe, J.--Information Technology for Management: Making Connections for Strategic Advantage. , 2nd Edition, John Wiley and Sons, 2002

Course Structure & Syllabus of
Open Electives
Applicable for 2016-2020 Batch

Course Title: **Consumer Electronics**			Course Code: **FA8710**
Credit: 3	L **3**	T **0**	P **0**
Year: **4th**			Semester: **VIII**

UNIT-I Lecture-8

Audio Systems: Microphones, Loudspeakers, Speaker baffle and enclosure, Acoustics, Mono, Stereo, Quad, Amplifying Systems, Equalisers and Mixers, Electronic Music Synthesisers, Commercial Sound, Theater Sound System

UNIT – II Lecture-8

Video Systems and Displays: Monochrome TV, Colour TV standards and systems, TFT, Plasma, HDTV, Digital TV, Video Telephone and Video Conferencing

UNIT III: Lecture-8

Domestic Appliances: Washing machines, Microwave ovens, Air- conditioners and Refrigerators, In car computers Office Systems: FAX, Xerox, Telephone Switching System, Mobile Radio System

UNIT IV: Lecture-8

Recording and Reproduction Systems: Disc recording and reproduction, Magnetic recording and reproduction, Video tape recording and reproduction, Video disc recording and play back, Distortion and Noise reduction in Audio and Video System

UNIT-V Lecture-8

Power Supplies and other systems: SMPS, UPS and Preventive Maintenance, Set Top Boxes, Remote controls, Bar codes, ATM

Text Books:

1. Consumer Electronics S P Bali Pearson ed 2005

Course Structure & Syllabus of
Open Electives
Applicable for 2016-2020 Batch

Course Title: **Industrial Psychology**			Course Code: **HA8710**
Credit: 3	L **3**	T **0**	P **0**
Year: **4th**			Semester: **VIII**

UNIT I
INTRODUCTION TO INDUSTRIAL PSYCHOLOGY (6Hrs)

1. Definitions, History & Scope of Industrial Psychology.
2. Major influences on Industrial Psychology-
3. Classical Approaches (Scientific Management)
4. Neo-Classical Approaches (Hawthorne Experiments)

UNIT II
INDIVIDUAL BEHAVIOR AT WORKPLACE (10 Hrs)
Emotional Quotient

1. Job Satisfaction–Job related attitude: Job Satisfaction; Satisfaction with regards to pay and supervision,
2. Measuring Job Satisfaction: Job Descriptive Index, Minnesota Satisfaction Questionnaire.
3. Relationship of Job Satisfaction with Productivity, Absenteeism and Attrition.
4. Motivation-Meaning and Concept of Motivation,
5. Theories of Motivation; Need Theories (Maslow McClelland and Herzberg). Cognitive Theories(Goal Setting Theory, Self-Efficacy Theory).

UNIT III
WORK ENVIRONMENT (6 Hrs)

1. Organizational Culture- Meaning and Types, Influence of Organizational Culture on Employees.
2. Leadership- Nature, Style and Approaches to Leadership
3. Group dynamics
4. Change Management

UNIT IV
PERFORMANCE MANAGEMENT (8 Hrs)

1. Job Analysis and Learning,
2. Training and Development- Objectives and Needs, Training Process
3. Methods of Training, Tools and Aids, Evaluation of Training Programs.
4. Methods of Performance Appraisal

UNIT V
STRESS AND CONFLICT MANAGEMENT (8Hrs)

1. Stress Management- Meaning, Causes, Types,
2. Work and Mental Health; Fatigue. Boredom, Accidents and Safety,
3. Everyday Stress and its management-Refuting Irrational Ideas, Rational Emotive Behavioral Therapy, Goal Setting and Time Management, Facing Worry and Anxiety.
4. Conflict–Definition, Traditional Vs. Modern view of conflict,

5. Types of Conflict – Intra personnel, Interpersonal, Organizational, Constructive and Destructive Conflict,
6. Conflict Management.

TEXT BOOK

1. Miner J.B. (1992) Industrial/Organizational Psychology. N Y: McGraw Hill.

REFERENCE BOOKS

1. Blum & Naylor (1982) Industrial Psychology. Its Theoretical & Social Foundations CBS Publication.
2. Aamodt, M.G. (2007) Industrial/Organizational Psychology: An Applied Approach (5th edition) Wadsworth/Thompson: Belmont, C.A.
3. Aswathappa K. (2008). Human Resource Management (fifth edition) New Delhi: Tata McGraw Hill.
4. Robbins, S.P. &Sanghi, S. (2009). Organizational behavior (11th ed.). New Delhi: Pearson Education.
5. Schultz, D. and Schultz, S. E. (2006). *Psychology and work today*. 8th ed. N.D.: Pearson Edu.

Course Structure & Syllabus of
Open Electives
Applicable for 2016-2020 Batch

Course Title: **Human Values & Ethics**			Course Code: **HA8720**
Credit: 3	L **3**	T **0**	P **0**
Year: **4th**			Semester: **VIII**

UNIT I: INTRODUCTION (7 Hours)

1. Nature of Value-Crisis in the contemporary Indian society, Meaning, Nature & Types of Values; Sources of Value Formation.
2. Holistic View of Life and Human Values, Foundational Human Values – Integrity, Freedom, Creativity, Morals, Love and Wisdom.

UNIT II: SOCIETAL VALUES & MATERIAL VALUES (7 Hours)

1. Definition of Society, Units of Society, and Social Consciousness.
2. Concepts& Principles of Interdependence, Conceptualizing 'Good Society' and 'Social Goods' and Corporate Social Responsibility.
3. Socio-Political Ideologies for promoting Material Well-being.
4. Role of Material Values in promoting Human Well-being.
5. Role of Science and Technology; Problems of Material Development.

UNIT III PSYCHOLOGICAL & SPIRITUAL VALUES (8 Hours)

1. Humanistic Psychology; Concept of Intelligence, Emotional Intelligence& Mental health.
2. Cognitive Dissonance & Ego Defense, Maslow's Hierarchy of Human Need; Characteristics of 'Self-Actualizing' persons.
3. Understanding Common Religion & Concept of Dharma.
4. Spiritual Values with Special Reference to Indian Spirituality.

Case Studies on the above aspects.

UNIT IV: ETHICAL VALUES & MORALITY (8 hours)

1. Principle of Ethics: Ethical Canons and their Significance in Modern lives.
2. Virtue Ethics; Personal Virtues for the Modern Times
3. Principles of Ethics, Bases for moral Judgments: Customary Morality, Religious Morality, Reflective Morality.

Case Studies on the above aspects

UNIT V PROFESSIONAL VALUES (10Hours)

1. Concept of Professional values; Definition, Competence , Confidence , Devotion to Duty, Efficiency , Accountability , Respect for learning / Learned , Willingness to Learn, Open and Balanced mind
2. Team spirit ; Willingness for Discussion, Aims, Effort , Avoidance of Procrastination and Slothfulness, Alertness, IEEE Code of Business Ethics

Case Studies Case Studies on the above aspects

BOOKS RECOMMENDED

1. Human Values - Prof. A.N.Tripathi New Age International, 2009
2. Human Values and Professional Ethics - Jayshree, Suresh and B.S. Raghwan , S. Chand Publication, 2011-12
3. Just Business: Business Ethics in Action- Elaine Sternberg, Oxford University Press, 2000.
4. Ethics in Engineering-Mike Martin and Roland Schinzinger, McGraw-Hill, New York, 1996.
5. Engineering Ethics-Govindarajan M, Natarajan S, Senthil Kumar V. S, Prentice Hall of India, New Delhi, 2004

Course Structure & Syllabus of
Open Electives
Applicable for 2016-2020 Batch

Course Title: **Organizational Behavior**	Course Code: **GA8710**
Credit: 3	L **3** T **0** P **0**
Year: **4th**	Semester: **VIII**

UNIT-1:
Organizational Behavior- Nature, Importance and Scope; Models of OB; Managing Workforce Diversity; Emerging Challenges for Management and OB, Determinants of Individual Behavior.

UNIT-2:
Foundations of Individual Behavior- Values, Attitudes, Personality, Perception and Emotions; Transactional Analysis; Johari Window; Motivation- Importance and Theories; Determinants of Personality; Personality Attributes influencing OB; Interactive Behavior and Interpersonal Conflict.

UNIT-3:
Foundations of Organizational Structure, Work Design and Technology, , Organizational Culture & Climate, Organizational Learning- Importance and Theories; Learning and Behavior Modification; Principles of Learning & Reinforcement.

UNIT-4:
Team Building and Group Dynamics; Working Teams and Team Effectiveness; Intra-Team Dynamics; Dynamics of Managerial Leadership; Leadership- Transition of Leadership Theories; Implementation of Leadership Theories in Contemporary Business Environment.

UNIT-5:
Organizational Conflicts; Power & Politics –Concept of Authority & Power; Sources of Power, Unequal Power in Organization, Organizational Politics, Dysfunctional Aspects of Politics, Organizational Communication, Functional and Dysfunctional Conflicts, Stages in Conflict.

Text Books:

1. Organizational Behaviour,understanding and managing life at work, 7th Ed., Johns, G., & Saks, A. Pearson.
2. Organizational Behaviour, 7 th ed. ,by Luthans, Fred McGraw-Hill, New York
3. Organizational behaviour,9th edition by Stephen P.Robbins. Prentice Hall International, Inc..
4. Luthans, Fred, Organizational Behaviour: An evidence based approach, 12th edition. Tata McGraw Hill

Reference Books:

1. Johns, G., and Saks, Organizational Behaviour- Understanding and Managing life at work, 7th Ed., Pearson.
2. Gerard H. Seijts, Cases in Organization Behavior, 1st Edition, Sage.
3. Jerald Greenberg, Behavior in Organizations, 10th Edition, Prentice Hall.
4. Uday Pareek, Understanding Organizational Behavior**,** 3rd Edition, Oxford University Press,

Course Structure & Syllabus of
Open Electives
Applicable for 2016-2020 Batch

Course Title: **Digital Marketing**			Course Code: **GA8730**
Credit: 3	L **3**	T **0**	P **0**
Year: **4th**			Semester: **VIII**

UNIT-1:
INTRODUCTION TO DIGITAL MARKETING

Digital Marketing Fundamentals – Definition, Different Terminologies (E-marketing, online marketing, web marketing, internet marketing), key constituents of Digital Marketing, scope of Digital marketing (Applications), Digital Marketing Plan, Concept of e-Business & e-commerce, Revenue or Business Models

Digital Marketing Revolution -Historical evolution of Internet, Changing face of media & Impact of Digital Channels, Digital Marketing Industry

Digital Marketing Environment - Political, Economic, Socio-cultural, Technological, Ethical and Legal Issues: Ethical codes, Privacy issues, Digital Property (Patents, Copyright, Trademarks, licenses), Different types of online payment modes, E-Security –Firewalls,

UNIT-2:
DIGITAL MARKETING STRATEGY

Digital Marketing Research - Data Driven strategy, Electronic Marketing information Systems, monitoring Social Media , Web Analytics tools

Online Consumer Behviour – Customer Personas, Online Consumer Behviour models, Online exchanges and outcomes.

Segmentation, Targeting and Positioning (STP) – three markets (Business, Government, Consumer), Segmentation bases (Geographic, Demographic, Psychographic, Behavioural), Targeting Online Customers, Differentiating and positioning Online

UNIT-3:
DELIVERING THROUGH DIGITAL MARKETING

Conceptualizing and Developing a Website – conceptualizing online Product (benefits, attributes, branding etc.), Researching Site User's requirement (Usability, Web Accessibility, and Localization), Reviewing Competitors' website, Designing the information architecture, Website Prototyping, Domain Name registration, Hosting a website.

Introduction to Website designing tools – Website designing editors (HTML, Dreamweaver 8), elements of site design, site design and structure, Page design, Content Design, Testing of Content, Other standardized website designing free resources (Google sites, blogs, Webs etc.)

Pricing and Distribution of Digital Offer.

UNIT-4:
DIGITAL MARKETING COMMUNICATION TOOLS

Integrated Marketing Communication (IMC), IMC tools, Differences in Advertising through traditional & Digital Media, Setting Online Marketing objectives - Conversion Marketing Objectives, Timescales for Objective setting, Campaign Cost Objectives

Online Promotion Techniques –

a) Search Engine Marketing - Search Engine optimization, Pay-per-click, Search Engine Marketing, Introduction to Google Adwords, Google Adsense
b) Interactive Advertising - Fundamentals and Purpose, Measurement, Interactive Ad targeting options, Interactive Ad formats, Making banner ads work, Buying Advertising

c) E-mail Marketing – Opt-in e-mail options for customer acquisition, Opt-in email options for Prospect Conversion and Customer retention(house list), Key success factors, Inbound e-mail communication
d) Online Public Relations
e) Online Partnerships - affiliate Marketing, Online sponsorship
f) Marketing using videos on Youtube, facebook etc.
g) Viral Marketing

UNIT-5:

MARKETING THROUGH SOCIAL MEDIA

The Horizontal Revolution, Strategic Planning with Social Media, The **four zones of social media**- Social Consumers, Social Communities , Social Publishing, Social Entertainment, Social Commerce, Creating and analyzing business pages on social networking sites such as Facebook, Twitter, Linkedin, Google+, role of Virtual communities and blogs, Social Media for Consumer Insight, Social Media Metrics, **Maintaining And Monitoring The Online Presence,**Defining Performance Metrics framework, Tools and techniques for collecting metrics and summarizing results, The Maintenance Process, Content Management Process.

Text Books & Reference Books

1. e-Marketing: Strass, El-Ansary, Frost
2. Social Media Marketing: Strategies for Engaging in Facebook, Twitter & Other Social Media by Liana Li Evans, Pearson Publication.
3. Social Median Marketing Book; By Dan Zarrel, O'Reilly Media.2009.
4. Digital Marketing: Strategy, Implementation and Practice, 5/E, Dave Chaffey, Pearson.

Course Structure & Syllabus of
Open Electives
Applicable for 2016-2020 Batch

Course Title: **Financial Modeling with Spreadsheet**			Course Code: **GA8740**
Credit: 3	L **3**	T **0**	P **0**
Year: **4th**			Semester: **VIII**

UNIT-1:
Overview on decision modelling, types of models, steps involved in decision modelling, problems in developing decision models, modelling through spreadsheet- hands on examples.

UNIT-2:
Linear programming models- concept, assumptions and applications, Formulating a linear programming model, graphical solution to LPP with two variables, Simplex algorithm

UNIT-3:
An introduction to transportation models, VAM and MODI methods, Unbalanced transportation models, Overview of assignment models

UNIT-4:
Overview on decision analysis, steps involved in decision analysis, Decision Tree Analysis, Forecasting models

UNIT-5:
Queuing models, characteristics of a queuing system, types of queuing systems, An overview on simulation modeling, Monte Carlo simulation, role of computers in simulation,.

Text Books:

1. Wayne L. Winston, Practical Management Science: spreadsheet modeling and applications
2. Taha, Hamdy, Operations Research, 7th edition, (USA: Macmillan Publishing Company), 2003
3. Vohra; Quantitative Techniques in Management (Tata McGraw-Hill, 2nd edition), 2003.
4. J K Sharma; Operations Research (Pearson)

Reference Books:

1. Managerial Decision Modelling with Spreadsheets; Nagraj Balakrishnan et al, Pearson Publication

Faculty of Pharmacy
Course Structure for M.Pharm.
Batch: 2016–2018

DIT UNIVERSITY

Dehradun

COURSE STRUCTURE & SYLLABUS
FOR
M. PHARM.
Batch 2016-18

Faculty of Pharmacy
Course Structure for M.Pharm.
Batch: 2016–2018

Year: 1st **Semester: I**

Course Code	Course Title	L	T	P	Credit
NBA010	Dosage form Design-I	4	0	0	4
NBA020	AAT (Advanced Analytical Technology)	4	0	0	4
NBA030	Pharmaceutical Excipient Technology	4	0	0	4
JBA040	Biostatistics & Computer Application	4	0	0	4
NBA610 **NBA620** **NBA630**	**Elective (ANY 1)** Sterile Technology Cosmetology Drug Regulatory Affairs	4	0	0	4
NBA110	Dosage form Design-I	0	0	6	3
NBA120	AAT (Advanced Analytical Technology)	0	0	6	3
NBA150	Seminar	0	0	2	1
					27

Year: 1st **Semester: II**

Course Code	Course Title	L	T	P	Credit
NBB010	Biopharmaceutics & Pharmacokinetics	4	0	0	4
NBB020	Advance Drug Delivery System	4	0	0	4
NBB030	Pharmaceutical Processing Technology	4	0	0	4
NBB610 **NBB620**	ELECTIVE (ANY 1) Packaging Technology Nano formulation & development	4	0	0	4
NBB110	Biopharmaceutics & Pharmacokinetics	0	0	10	3
NBB120	Advance Drug Delivery System	0	0	12	3
NBB140	**Seminar**	0	0	2	1
					23

Faculty of Pharmacy
Course Structure for M.Pharm.
Batch: 2016–2018

Year: 2nd **Semester: III**

Course Code	Course Title	L	T	P	Credit
NBC110	Synopsis				6
NBC120	Research Progress Presentation & Report				6
					12

Year: 2nd **Semester: IV**

Course Code	Course Title	L	T	P	Credit
NBD110	Dissertation Evaluation				12
NBD120	Presentation & Viva				6
					18

Summary of Credits

Year	Semester	Credit	Year Credit
First Year	**I**	**27**	**50**
	II	**23**	
Second Year	**III**	**12**	**30**
	IV	**18**	
Total Credits			**80**

Faculty of Pharmacy
Course Structure for M.Pharm.
Batch: 2016–2018

Course Title: **Dosage form Design-I**	Course Code: **NBA010**
Credit: **4**	L T P **4 0 0**
Year: **1st**	Semester: **I**

Unit I

A study of the Indian pharmaceutical industry vis- a vis global scenario (Detail studies about top 5 National and Multi National Pharma industries including SWOT analysis).

(**7)**

Unit II

Stages in product development - flow chart. (acceptance criteria)

Preformulation studies. including decision tree

(**8)**

Unit III

Basic concepts in designing and development of Pediatric and geriatric

Formulations and Evaluation of various Pediatric formulations and Oral Drug Delivery Systems.

(10)

Unit IV

A. Design and Qualification of automatic dissolution systems
B. Development of dissolution tests and interpretation

(5)

Unit V

Stability testing – stress testing of drug substances, stability indicating assays. Role of kinetic studies, Development of Satability Indicating method, Stability guidelines for Pharmaceutical Products and post approval changes.

WHO & GLP Guidelines of APIs & Finished Pharmaceutical Products.

(10)

Text Book: Title, Author, Publication House, Edition, Year

Books Recommneded (Current Edition) :-

1. The drug Development Hand book series, part 1 & 2 Locum House Publication, USA.
2. Bankers & Rhodes , Modern Pharmaceutics", Marcel Dekker.
3. Swarbrick James & Boylan J.C. " Encyclopedia of pharmaceutical technology", Marcel Dekker.
4. Lachman, Leon, . Lieberman H.A, Kanig J. L., The theory & practice of industrial pharmacy", Varghese Publication House, Bombay.
5. Rowe R.C., Sheskey P.J., & Owen S.C., "Handbook of Pharmaceutical Excipients" Pharmaceutical Press, London.

6. Aulton M.E , Pharmaceutics: The design & manufacture of medicine, Churchill Livingstone, London.
7. Ansel H.C, Allen L.V.,.Popovich N.G, “Pharmaceutical Dosage forms and drug delivery systems” , Indian edition, Lippincott Williams & Wilkins, B.I.Publications.
8. Carstensen, J.T, Rhodes C.T. “Drug stability”, Marcel Dekker.
9. Wise D.L., “Handbook of Pharmaceutical Controlled release technology Marcel Dekker .
10. Indian Pharmacopoeia, British Pharmacopoeia, U.S.P./ N.F.
11. Weiner M.L, Kotkoskie L.A., Excipient Toxicity & Safety, , Marcel Dekker.
12. Guarino R.A, New Drug Approval process: the global challenge Marcel Dekker.
13. Rodriguer A.D. Drug- drug interaction, Marcel Dekker
14. Dressman J & Kramer J. Pharmaceutical Dissolution testing, Taylor & Frances.
15. Blaisdell Peter Twenty first century Pharmaceutical development , Interpharm press Denver, Colorado.
16. Relevant Websites

Faculty of Pharmacy
Course Structure for M.Pharm.
Batch: 2016–2018

Course Title: **AAT (Advanced Analytical Technology)**	Course Code: **NBA020**		
Credit: **4**	L **4**	T **0**	P **0**
Year: **1st**			Semester: **I**

Unit I

UV-Visible spectroscopy- Introduction and Instrumentation. Application in determination of pKa values, pharmaceutical quantitative analysis, Difference spectrophotometry, derivative spectra. Solid State Analysis: X-ray diffraction and crystallography, thermal analysis, DSC, TGA . (8)

Unit II

Infrared spectroscopy- Introduction, Principle and Instrumentation of FTIR. Application in structure elucidation and in identifying polymorphs, APIs, Finished Pharmaceutical Products and Excipients. (8)

Unit III

a) Nuclear Magnetic Resonance Spectroscopy: Introduction, instrumentation, chemical shifts, shielding and deshielding effects, spin-spin coupling, reference standard and solvents, proton NMR, carbon-13 NMR Application to structure elucidation.

b) Mass Spectrometry: Principle, instrumentation, mass spectra obtained under electron impact (EI) ionization conditions, molecular fragmentation patterns, molecular ion, metastable ion, Mc-Lafferty rearrangement, EI mass spectra of some drug molecules. GC-MS and LC-MS: principle and applications. (12)

Unit IV

Chromatographic techniques: Chromatographic Theory: void volume, capacity factor, band broadening, and calculation of column efficiency, parameters used in evaluating column performance (resolution and peak asymmetry). HPLC: instrumentation, stationary phases, mobile phases and its selection, columns and detectors, applications in quantitative analysis of drugs in formulations, specialized HPLC techniques. HPTLC, GC, High-performance capillary electrophoresis: principle, instrumentation and application. Method Development and Validation for HPLC, HPTLC for any two API and Marker Compounds. (12)

Unit V

Spectral data Interpretation of APIs, Pharmaceutical Excepients by NMR, Mass, GC MS, IR, DSC and Other Spectroscopic Data (Any 5 for each). (8)

Text Book: Title, Author, Publication House, Edition, Year

Books Recommneded (Current Edition) :-

1 Watson, D.G., Pharmaceutical Analysis, A Textbook for Pharmacy Students and Pharmaceutical Chemists,Elsevier Churchill Livingstone.

2 Lee, D.C., Webb, M., Pharmaceutical Analysis, Blackwell Publishing, CRC Press, Wiley India Pvt. Ltd.

3 Willard, H. H., Merrit, L.L., Dean, J. A., Settle P. A., Instrumental Methods of Analysis, Von Nostrand.
4 Skoog, D.A., Holler, F.J., Nieman, T.A., Principles of Instrumental Analysis, Thomson Brooks/Cole.
5 Christian, G, D., Analytical Chemistry, John Wiley and Sons.
6 Ahuja,S., Rasmussen,H., HPLC method development for Pharmaceuticals, Elesevier Academic Press.
7 Silverstein, Spectrometric identification of Organic Compounds, Willy.
8 Kemp William, Organic Spectroscopy, Pal grave, New York.
9 Beckett and Stenlake, Practical Pharmaceutical Chemistry, CBS Publishers, New Delhi.
10 Sethi, P.D., Quantitative Analysis of Drugs in Pharmaceutical Formulations, CBS Publishers, New Delhi.

Faculty of Pharmacy
Course Structure for M.Pharm.
Batch: 2016–2018

Course Title: **Pharmaceutical Excipient Technology**	Course Code: **NBA030**
Credit: **4**	L: **4** T: **0** P: **0**
Year: **1st**	Semester: **I**

Unit I

Introduction, Excipients for Over-the-Counter Drugs, Excipients in New Drugs, Informal Mechanisms to Promote Excipient Acceptance, Generally Recognized as Safe Notification Worldwide Food Additive Status, Excipient Development Stagnation. Food and Drug Administration Excipient Guidance , Industry Initiatives Food and Drug Administration, Regulation of Pharmaceutical Excipients. (12)

Unit II

IPhysicochemical characteristics of Excipients, Excipient Interactions, Excipient Compatibility Studies, Physiological/Biopharmaceutical Interactions. Improved Excipient Functionality by Co processing, Evaluation of Excipients (8)

Unit III

Excipient Selection and Criteria for oral Solid, oral Liquid, semisolids and pulmonary Formulations, Monograph Studies and research updates of Pharmaceutical Excipients (any 08) (12)

Unit IV

Excipient Selection and Criteria for Injectables, Proteins and Vaccines, Challenges in Designing Multicomponent Chemical Penetration Enhancer, Synergistic Combinations of Penetration Enhancers.IPEC Excipients guidelines and evaluation (8)

Unit V

Polymers used in drug delivery, characterization of polymers, Designing of novel polymers, Biopolymers, Application of Polymers, Recent advancement in polymer technology. (8)

Text Book: Title, Author, Publication House, Edition, Year

Books Recommended (Current Edition) :-

1R.C. Rowe, P.J. Sheskey and M.E. Quinn Handbook of Pharmaceutical Excipients, 6th Edition, August 2009 The Pharmaceutical Press, London, UK; American Pharmaceutical Association, Washington DC, USA

2Indian Pharmacopoeia

3British Pharmacopoeia

4U.S.P. / N.F.

5Raymond C Rowe - Chief Scientist, Handbook of Pharmaceutical Excipients **Technical Services Leader, Royal Pharmaceutical Society of Great Britain, London, UK**

Faculty of Pharmacy
Course Structure for M.Pharm.
Batch: 2016–2018

Course Title: Title: **Biostatistics & Computer Application**	Course Code: **JBA040**		
Credit: **4**	L **4**	T **0**	P **0**
Year: **1st**			Semester: **I**

Unit I

Basic Definitions and Concepts: Variables and Variation, Frequency Distributions and Cumulative Frequency Distributions, Sample and Population, Measures Describing the center of Date Distributions, Data Graphics: Introduction, the Histogram, Construction and Labeling of Graphs, Scatter Plots (Correlation Diagrams), Semi-logarithmic Plots, Other Descriptive Figures. Introduction to Probability The Binomial and Normal Probability Distributions : Introduction, Some Basic Probability, Probability Distributions, the Binomial Distribution(8)

Unit II

Choosing Samples Sample Size and Power : Introduction, Random Sampling, Other Sampling Procedures: Stratified, Systematic, Cluster Sampling, Sampling in Quality Control Introduction, Determination of Sample Size for Simple Comparative Experiments for Normally Distributed Variables, Determination of Sample Size for Binomial Tests,. Statistical Inference: Estimation and Hypothesis Testing: Statistical Estimation (Confidence Intervals), (8)

Unit III

Linear Regression and Correlation: Introduction of linear and non linear Regression, Analysis of Standard Curves in Drug Analysis: Application of Linear Regression and Drug stability studies. **Analysis of Variance:** One- Way Analysis of Variance (Kruskal Wallis Test), Two-Way Analysis of Variance, ANOVA for pooling regression lines as related to stability data. **Nonparametric Methods:** Data Characteristics and an Introduction to Nonparametric Procedures, Sign Test, Wilcoson Signed Rank Test, Wilcoxon Rank Sum Test (Test for Differences Between Two Independent Groups). **Factorial Designs:** Definitions Two Simple Hypothetical Experiments to Illustrate the Advantages of Factorial Designs, Performing Factorial Experiments: Recommendations and Notation, A Worked Example of a Factorial Experiment, Fractional Factorial Designs. (12)

Unit IV

Experimental Design in Clinical Trials: Introduction, Some Principles of Experimental Design and Analysis, Parallel Deign, Crossover Designs.
Bioavailability / Bioequivalence Studies, Repeated Measures (Split- Plot) Designs, Multiclinic Studies, Interim Analyses, Multicentric Analysis (8)

Unit V

Applications of Computers in Pharmaceutical Sciences, Literature survey filters (Pubmed), Computer Intensive Methods: Advance Computer application and software applicable for treating statistical data. (8)

Text Book: Title, Author, Publication House, Edition, Year

Books Recommended (Current Edition) :-

1 Bolton, S and Bon, C, Pharmaceuticals Statistics- Practical & Clinical Applications, Marcel & Dekker, New York.
2 Fisher, R.A., Statistical Methods for Research Works, Oliver & Boyd, Edinburgh.
3 Chow, Statistical Design and Analysis of Stability Studies, Marcel Dekker, New York.
4 Buncher, Statistics in the Pharmaceutical Industry, Marcel Dekker, New York.
5 William E. Fassett, Computer Application in Pharmacy.
6 Ekins, S., Computer Application in Pharmaceutical Research & Development, Wiley.

Faculty of Pharmacy
Course Structure for M.Pharm.
Batch: 2016–2018

Course Title: Title: **Sterile Manufacturing Technology**	Course Code: **NBA610**		
Credit: 4	L	T	P
	4	**0**	**0**
Year: **1st**	Semester: **I**		

Unit I

Designing a parenteral production facility: General consideration, site selection, planning for production facilities, design concept, waste disposal, sanitation and equipment cleaning. (10)

Un it II

Environmental control in parenteral drug manufacturing: Aseptic classification of aseptic processing environment, control of contamination, environmental contamination control design system, clean room and personal contamination control. (10)

Unit III

Formulation, processing and manufacturing of SVPs: Preparation of SVPs solution, suspension, freeze dryer product, manufacturing of SVPs, raw materials, qualification, stability, manufacturing of simple solution, liquid emulsion, specialize product, in process quality control and final product testing. (10)

Unit IV

Parenteral products of peptides & proteins: Characteristic of peptides and proteins, formulation principle and compatibility with packaging components (10)

Unit V

Production and Management of Ophthalmic Preparations, Vaccine & Sera. (10)

Text Book: Title, Author, Publication House, Edition, Year

Books Recommended (Current Edition) :-

1 Sarfaraz K. Niazi Handbook of Pharmaceutical Manufacturing Formulations,Volume Six,Sterile Products,Second edition Informa Healthcare, 2009

2 Grinding, Honing, Lapping Manufacturing Processes 2 RWTHedition

Faculty of Pharmacy
Course Structure for M.Pharm.
Batch: 2016–2018

Course Title: Title: **Cosmetology**	Course Code: NBA620		
Credit: 4	L	T	P
	4	**0**	**0**
Year: **1st**	Semester: **I**		

Unit I

Plant layout, facilities and process used in manufacturing of cosmetics.(10)

Unit II

Cosmetic raw materials, Adverse Effects of Cosmetics and quality control of raw materials, intermediate and finished cosmetic products

Unit III

a) Topical Cosmoceuticals: Skin Lotion, Anti-sunburn preparation, topical exfoliation, Cosmetics used for nail, finger nail elongators.
b) Cosmetic used for babies, Hyperallergic cosmetics.
c) Lipsticks, powders, dental preparation and medicated soaps, shampoos (10)

Unit IV

Advances in cosmetic delivery system: Liposomal formulation and nano formulation (10)

Unit V

Safety Standards and Stability Challenges for Cosmetics. (10)

Text Books:

1Milady's Standard Cosmetology by Arlene Alpert, Milady's Standard Cosmetology Textbook 2012

Books Recommended (Current Edition) :-

1 Ferguson Cosmetology / Edition 4, Facts on File, Incorporated

Faculty of Pharmacy
Course Structure for M.Pharm.
Batch: 2016–2018

Course Title: Title: **Drug Regulatory Affairs**	Course Code: **NBA630**
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: **I**

Unit I

Pharma and Food industry Building Design and Qualification, Clean room classification and air control measures for various classes of Foods, Drugs and Pharmaceuticals.. (10)

Unit II

a) Food and Drug, pharmaceuticals safety and Quality manuals Q7-Q10 Product development, validation and technology transfer manuals design, Process methods

b) Preparation, documentation and validation for Audit (10)

Unit III

CFR - CGMP requirements - 21 CFR parts 210 and 211, Orange Guide, TRS, ICH.

GLP - Facilities for quality control lab qualifying GLP requirements. (10)

Unit IV

Intellectual property rights, patents Act, Trademark and Copyright Act(10)

Unit V

Analytical methods protocol design, methods validation and validation reports, Stability data methods and data generation. (10)

Books Recommended (Current Edition) :-

1 Gennaro A.R., Remington- The science and practice of pharmacy, Lippircott, Williams & Wilkins.

2Banker G.S., Rhodes C.T., Modern Pharmaceutics, Marcel Dekker.

3Malik Vijay, Drug & Cosmetics Act, 1940, Eastern Book Company, Lucknow.

4Guarino R.A., New Drug Approval Process, Marcel Dekker.

5Sharma P.P., How to practice GMP, Vandana Prakashan, New Delhi.

6Sharma P.P., how to practice GLP, Vandana Prakashan, New Delhi,

7World Health Organization, quality assurance of Pharmaceuticals I & I, Pharma Book Syndicate, Hyderabad.

8Weinlerg S., Good Laboratory Poactices, Marcel Dekker.

9The Patent Act, 1970

10The Trade Marks Act, 1999.

11The Copyright Act, 1958.

12Rick N.G., Drug from Discovery to Approval, Wiley Black Well.

13Swarlerick J., Boylan J., Encyclopedia / Pharmaceutical Technology Relevant Welesites of Regulatory Anthoriter of different countries.

Faculty of Pharmacy
Course Structure for M.Pharm.
Batch: 2016–2018

Course Title: Title: **Biopharmaceutics & Pharmacokinetics**	Course Code: **NBB010**		
Credit: **4**	L	T	P
	4	**0**	**0**
Year: **1st**	Semester: **II**		

Unit I

Introduction to BCS classification of drugs.

a) Gastrointestinal absorption of drugs- Biologic, Physicochemical consideration and role of dosage form.
b) Drug distribution, drug binding in blood and tissues, Volume of distribution (Vd).
c) Drug metabolism, excretion and Clearance. (12)

Unit II

a) Pharmacokinetics: compartment models - one compartment & multi compartment models.
b) Non compartmentl & non linear Pharmacokinetics (12)

Unit III

Pharmacokinetic Variability – Body weight, Age, Sex, Genetic factors, Disease and Drug Interactions (8)

Unit IV

Bioavailability – Introduction, measurement and enhancement, in vitro dissolution & in vivo bioavailability (In vitro – in vivo correlation) bioavailability and bioequivalence studies- protocol and regulatory requirement (8)

Unit V

Dosage regimens - repetitive dosing and dose adjustments in renal and hepatic failure. Individualisation and optimization of drug dosing regimens.. (8)

Books Recommended (Current Edition) :-

1Shargel Leon Applied Biopharmaceutics & Pharmacokinetics, McGraw- Hill.
2Notari R. E., Biopharmaceutics and Clinical Pharmacokinetics, an introduction, Marcel Dekker
3Gilbaldi M and Perrier D, Pharmacokinetics, Marcel Dekker.
4Venkateshwaralu v, Biopharmaceutics & Pharmacokinetics, Pharma Book Syndicate.
5Gilbadi M, Biopharmaceutics and clinical Pharmacokinetics, Pharma Book
6Rowland & Tozer, Clinical Pharmacokinetics- Concept and application, Waverly Welling P.G., Tse F.L., Pharmaceutical Bioequivalence, Marcel Dekker.

Faculty of Pharmacy
Course Structure for M.Pharm.
Batch: 2016–2018

Course Title: Title: **ADDS (Advanced Drug Delivery System)**		Course Code: **NBB020**		
Credit: **4**		L	T	P
		4	**0**	**0**
Year: **1st**			Semester: **II**	

Unit I

a) Theory of controlled release drug delivery systems.
b) Physical, chemical and biomedical engineering approach to achieve controlled drug delivery.(8)

Unit II

Factors influencing delivery, formulation, evaluation and Recent Advancement of – Trans-mucosal, Gastro-retentive and colonic drug delivery system (10)

Unit III

Design, Evaluation & Recent Advancements in Transdermal, Liposomes, Niosomes, Microgels, Nanogels, Emulgels, SNEEDS, Hydrogels, SEDDS, Osmotic Pump Drug Delivery. 8)

Unit IV

Target oriented drug delivery systems- : Pulmonary Drug Delivery, Cell Specific Drug Delivery, Gene Delivery, Pro Drug, ADEPT, GDEp, Monoclonal Antibodies, Parenteral formulation for peptides and protein drugs. (10)

Unit V

Vaginal and Interuterine drug delivery, transungual drug delivery, transcranial drug delivery, Nose to Brain, and Stemceuticals.(8)

Text Book: Title, Author, Publication House, Edition, Year

.**Books Recommended (Current Edition) :-**

1 Chien Y.W., Novel Drug Delivery Systems, Marcel Dekker
2 Robinson J.R. and Lee V.H., Controlled Drug Delivery: Fundamentals & Applications, Marcel Dekker.
3 Tse F.L.S. and Jaffe J.J., Biodegradable Polymers as Drug Delivery Systems, Marcel Dekker
4 Banker G.S., Rhodes C.T., Modern Pharmaceutics, Marcel Dekker.
5 Wise D.L., Handbook of Pharmaceutical Controlled Release Technology, Marcel Dekker.
6 Guy R.H., Hadgraft J., Transdermal Drug Delivery, Marcel Dekker.
7 Rathbone M.J., Hadgraft J., Modified Release Drug Delivery Technology, Marcel Dekker.
8 Swarbrick J. & Boylan J.C., Encyclopedia of Pharmaceutical Technology, Marcel Dekker

Faculty of Pharmacy
Course Structure for M.Pharm.
Batch: 2016–2018

Course Title: Title: **Pharmaceutical Processing Technology**	Course Code: **NBB030**		
Credit: **4**	L	T	P
	4	**0**	**0**
Year: **1st**	Semester: **II**		

Unit I

Pilot Plant, Scale up Techniques: Introduction**,** Objectives of the Pilot Plant**,** Importance of the Pilot Plant**,** Pilot plant design for tablets**,** Pilot plant scale-up techniques for capsules**,** Pilot plant scale-up techniques for Parenterals. (10)

Unit II

Introduction of Optimization, Optimization Techniques, Elements Of Validation, Validation Master Plan, Reasons for validation, Pharmaceutical Process Validation, Equipment Validation and Product Validation, Regulatory Basis for Process Validation. (10)

Unit III

Technology Transfer involved in different dosage forms: importance of technology transfer, Technology Transfer Process, Reasons & factors influencing technology transfer, drivers and barriers, steps involved in technology transfer and to identify policy approaches for barriers.(8)

Unit IV

Material Management, Forecasting, Purchasing, Pricing Issues, Inventory Control. (8)

Unit V

Automation and control In pharmaceutical Industries: Advantages, General Automatic Control System, Automatic Controller, Computer Integrated Systems, Control Process Measurement, Automation in Solid & Liquid Dosage Manufacturing. (10)

Books Recommended (Current Edition) :-

1 Lachman Leon,. Lieberman H.A, Kanig J. L. The theory & practice of industrial pharmacy", Varghese Publication House, Bombay.

2 Levin Michael Pharmaceutical process scale- up , Marcel Dekker.

3 Williams R.O., Taft D.R, Mc- Conville ., J.T. Advanced drug formulation design the optimize therapeutic outcomes , Marcel Dekker

4 Banker & Rhodes Modern Pharmaceutics", Marcel Dekker .

5 Nash Robert A, Wachter, A.H Pharmaceutical Process Validation., Marcel Dekker .

6 d'Spouts, J.F Automation & validation of information in pharmaceutical processing., Marcel Dekker.

7 Swarbrick J. & Boylan J.C., Encyclopedia of Pharmaceutical Technology, Marcel Dekker.

Faculty of Pharmacy
Course Structure for M.Pharm.
Batch: 2016–2018

Course Title: Title: **Packaging Technology**			Course Code : **NBB610**
Credit: 4	L	T	P
	4	**0**	**0**
Year: **1st**			Semester: **II**

Unit I 1.

Introduction: Purpose of packaging, prerequisites of an ideal pnmjackage, various types of inner and outer packages used for different pharmaceutical dosage forms, selection criteria for a suitable packaging material, hazards encountered by the package during storage and distribution, Child Resistant Packaging and Tamper Evident Packaging. (10)

Unit II 1.

Strip, blister, Alu –Alu Packaging & pouch Packaging: advantages, limitation, packing materials used, machinery, types and evaluation of strips, blister & pouch package. (10)

Unit III 1.

Solid, Liquid &Semi-Solid: Various packages /containers /closures employed, Machinery and Evaluation of solid, liquid and Semi-Solid formulation packages. (10)

Unit IV 1.

Packaging requirements for Opthalmic, Sterile, Immunological Product and chemicals used in the synthesis of APIs & Excipients. (10)

Unit V

a) Labeling: Objectives and contents of a pharmaceutical label. Types of label (including Bilingual label, Bar code label, Radiofrequency (RF) label, Structured Program Label, In - mould label and decorative labels), Legal requirements of labeling, packaging inserts and outserts. Adhesives and machinery employed for labeling. Concept of paperless labeling and new developments in labeling technologies.

National & International rules & regulations governing packaging of Pharmaceutical products. (10)

Text Book: Title, Author, Publication House, Edition, Year

Books Recommended (Current Edition) :-

1A. Dean, E. R. Evans, Pharmaceutical Packaging Technology H. Hall CRC Press, 12-Jul-2005

2Madjackfrost, Pharmaceutical Packaging Handbook on October 5, 2009. 23

Faculty of Pharmacy
Course Structure for M.Pharm.
Batch: 2016–2018

Course Title: Title: **Nano Formulation Dosage Form**			Course Code : **NBB620**
Credit: 4	L	T	P
	4	**0**	**0**
Year: **1st**			Semester: **II**

Unit I

Fundamentals of Drug Nanoparticles :- Introduction, Nanoparticle Size, Nanoparticle Surface, Nanoparticle Suspension and Settling. Magnetic and Optical Properties, Production of Nanoparticles, Biological Transport of Nanoparticles. (10)

Unit II

Manufacturing of Nanoparticles by Milling and Homogenization Techniques, Supercritical Fluid Technology and Recent Advances

Nanoparticles from Emulsions

Introduction. Emulsification Solvent Evaporation Process. Nanoparticle Hardening. Residual Solvent and Emulsifier. Protein Stabilized Nanoparticles. (10)

Unit III

Nanoparticle characterization and properties, Physical Characterization of Nanoparticles, **Nanoparticle Interface:** An Important Determinant in Nanoparticle-Mediated Drug/Gene Delivery.

Toxicological Characterization of Engineered Nanoparticles. (10)

Unit IV

Drug Delivery Application :- Nano carriers and Injectable Nanoparticles for Efficient Drug Delivery, Polymeric Nanoparticles for Oral Drug Delivery, Brain Delivery by Nanoparticles, Nanoparticles for Ocular Drug Delivery, DNA Nanoparticle Gene Delivery Systems. (10)

Unit V

Micromeretics And Powder Rheology: Average particle size, Particle size distribution, number and weight distribution, particle number; methods for determining particle size – optical

Text Book: Title, Author, Publication House, Edition, Year

Books Recommended (Current Edition) :-

a. Nanoparticle Technology for Drug Delivery, edited by Ram B. Gupta and Uday B.Kompella
b. Nanoparticulate Drug Delivery Systems, edited by Deepak Thassu, Michel Deleers, and Yashwant Pathak
c. Drug Delivery Nanoparticles Formulation and Characterization, edited by Yashwant Pathak and Deepak Thassu
d. Modern Pharmaceutics, Fifth Edition, Volume 1: Basic Principles and Systems,edited by Alexander T. Florence and J¨urgen Siepmann .
e. Modern Pharmaceutics, Fifth Edition, Volume 2: Applications and Advances,edited by Alexander T. Florence and J¨urgen Siepmann

DIT UNIVERSITY

Dehradun

COURSE STRUCTURE

OF

M.TECH. IN CIVIL ENGINEERING

(STRUCTURAL ENGINEERING)

BATCH 2016 – 18

Department of Civil Engineering
Curriculum Structure for M.Tech. in Civil Engineering
(Structural Engineering)
Batch: 2016-18

Year: 1st **Semester: I**

Course Code	Course Title	L	T	P	Credit
JBA010	Advanced Engineering Mathematics	4	0	0	4
CBA010	Advanced Concrete Technology	4	0	0	4
CBA020	Pre Stressed Concrete	4	0	0	4
CBA030	Matrix Method of Structural Analysis	4	0	0	4
CBA110	Advanced Concrete Laboratory	0	0	2	1
	Total				**17**

Year: 1st **Semester: II**

Course Code	Course Title	L	T	P	Credit
CBB010	Finite Element Analysis	4	0	0	4
CBB020	Advanced Reinforced Concrete Design	4	0	0	4
	Elective – II	4	0	0	4
	Elective - III	4	0	0	4
CBB110	Dissertation Phase-I	0	0	4	4
	Total				**20**

List of Electives – (Semester – II)

Sl. No.	Course Code	Course Title
1	CBB610	Solid Mechanics
2	CBB620	Foundation Engineering
3	CBB630	Soil Structure Interaction
4	CBB640	Design of Steel and composite structures
5	CBB650	Seismic Design of Structures
6	CBB660	Ground Improvement Techniques
7	CBB670	Structural Dynamics

Department of Civil Engineering
Curriculum Structure for M.Tech. in Civil Engineering
(Structural Engineering)
Batch: 2016-18

Year: 2nd **Semester: III**

Course Code	Course Name	L	T	P	Credits
	Elective – IV	4	0	0	4
	Elective - V	4	0	0	4
CBC110	Seminar	0	0	2	4
CBC120	Dissertation Phase-II	0	0	4	8
	Total				**20**

List of Electives – (Semester – III)

Sl. No.	Course Code	Course Title
1	CBC610	Construction Techniques and Management
2	CBC620	Bridge Engineering
3	CBC630	Design of Tall Buildings
4	CBC640	Design of Reinforced Concrete Foundations
5	CBC650	Maintenance and Rehabilitation of Structures
6	CBC660	Optimization in Structural Design
7	CBC670	Hydraulic Structures
8	CBC680	Dynamics of Earth and Environment

Year: 2nd **Semester: IV**

Course Code	Course Name	L	T	P	Credits
CBD110	Dissertation Phase-III	0	0	32	16
	Total				**16**

Summary of the Credits

Year	Semester	Credit	Year Credit
First Year	**I**	**17**	**37**
	II	**20**	
Second Year	**III**	**20**	**36**
	IV	**16**	
Total			**73**

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Course Title: **Advanced Engineering Mathematics**			Course Code: JBA010
Credit: 4.0	L	T	P
	4	**0**	**0**
Year: 1st			Semester: I

UNIT-I

Numerical Techniques

Zeros of Transcendental and Polynomial equation using bisection method, Newton-Raphson method, Rate of convergence of above methods. Interpolation: Finite differences, difference tables, Newton's Forward and Newton's Backward Interpolation, Lagrange's and Newton divided difference formula for unequal intervals. Solution of system of Linear equations, Gauss-Seidal method, Crout method. Numerical Integration: Trapezoidal rule, Simpson's one-third rule, Simpson's three-eighth rule, Solution of ordinary differential (first order, second order and simultaneous) equations by Picard's and Fourth order Runga - Kutta methods

UNIT-II

Partial Differential Equations (PDE)

Formation and Classification of PDE, Solution of One Dimension Wave Equation, and Heat Equation, Two Dimension Heat and Laplace Equation by Separation of variables Method.

UNIT-III

Special Functions

Series solution of ODE of 2nd order with variable coefficient with special emphasis to Legendre and Bessel differential equation, Legendre polynomial of first kind, Bessel Function of first kind and their properties.

UNIT-IV

Statistics:

Elements of statistics, frequency distribution: concept of mean, median, mode, Standard derivation, variance and different types of distribution: Binomial, Poisson and Normal distribution, curve fitting by least square method, Correlation and Regression, Concept of Hypothesis Testing.

UNIT-V

Optimization:

Formulation, Graphical method, Simplex method, Two-Phase simplex method, Duality, Primal-dual relationship, Dual-simplex method.

Text Books:

- R. K. Jain & S. R. K. Iyenger: Advanced Engineering Mathematics, Narosa publication, 2014.
- Jain, Iyenger & Jain: Numerical methods for scientific & Engg. Computation, New age, 2003.
- Gupta S. C., Kapoor V. K.: Fundamentals of Statistics, Sultan Chand & Sons, Eleventh Edition (Reprint) 2014.

Reference Books:

- E. Kreyszig: Advanced Engineering Mathematics, Wiley publication.
- B.S. Grewal: Higher Engineering Mathematics, 42nd Edition, Khanna Publication, India, 2012.

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Course Title: **Advanced Concrete Technology**			Course Code: CBA010
Credit: 4.0	L **4**	T **0**	P **0**
Year: 1st			Semester: I

Course Objectives: Concrete is the most widely used material in the world. It plays an important role in infrastructure and private buildings construction. This course is designed to impart more comprehensive knowledge on concrete technology, including the introduction of end use guided research strategy for concrete, unification of materials and structures studies, and an emphasize on fundamental exploration of concrete structures, state of art of concrete development, and innovations.

UNIT-I

Aggregates classification, Testing of Aggregates, fibers. Cement, grade of Cement, chemical composition, Hydration of Cement, Structure of hydrated Cement, Special Cement, Water, Chemical and Mineral Admixtures.

UNIT-II

Principles of Concrete mix design, methods of Concrete mix design, Design of high strength and high performance concrete.

UNIT-III

Rheological behavior of fresh Concrete- Properties of fresh and hardened concrete- Strength, Elastic properties, Creep and Shrinkage, Variability of concrete strength. Non-destructive testing and quality control, Durability, corrosion protection and fire resistance.

UNIT-IV

Modern trends in concrete manufacture and placement techniques, Methods of transportation, Placing and curing-extreme whether concreting, special concreting methods, Vacuum dewatering of concrete-Under water concreting.

UNIT-V

Light weight Concrete, Fly-ash Concrete- Fibre reinforced Concrete, Polymer Concrete, Epoxy resins and screeds for rehabilitation- properties and application.

Learning Outcomes: This Course would prove to be very useful for all structural engineering students whether they are heading for design industry or construction industry or even for academics. The course content spans from basic concept of concrete technology to the highly advanced methods involve in concreting practices. The subject not only trains a student for hands on practice for mix design of concrete but it also helps them in understanding the NDT, special concreting methods and rehabilitation methods in concreting.

Text Books:

1. Krishnaraju, N., Advanced Concrete Technology, CBS Publishers, 1985.
2. Nevile, A.M., Concrete Technology, Prentice Hall, Newyork, 1985.
3. A.R. Santhakumar, :Concrete Technology" Oxford University Press, 2006

References:

1. Shetty,M.S. "Concrete Technology", S.Chand & Company, New Delhi,2002.
2. Gambhir, M.L. "Concrete Technology", Tata McGraw Hill New Delhi, 1995.
3. Design of Concrete Mixes by N.Krishna Raju, CBS Publications, 2000.
4. Concrete: Micro Structure by P.K.Mehta, ICI, Chennai.

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Course Title: **Pre Stressed Concrete**			Course Code: CBA020
Credit: 4.0	L **4**	T **0**	P **0**
Year: 1st			Semester: I

Course Objective: To perform analysis and design of pre-stressed concrete members and connections and to become familiar with professional and contemporary issues in design and fabrication of pre-stressed concrete members.

UNIT-I

Materials, Basic Principles of Pre-Stressing, Pre-stressing Systems: Basic concepts of pre-stressing, High strength concrete and steel, Stress-strain characteristics and properties, Various pre-stressing systems, Pre-tensioning and Post-tensioning systems with anchorages, Advantages and limitations of pre-stressed concrete.

UNIT-II

Analysis of Sections for Flexure: Basic assumptions, Analysis of stresses in concrete due to pre- stress and loads for different types of cross section, Pressure line or thrust line, Cable profile, Concept of load balancing, Cracking moment.

UNIT-III

Losses of Pre-Stress & Deflections: Nature of losses in pre-stress, various losses encountered in pre-tensioning and post tensioning methods, Deflection, Factors influencing deflection, Elastic deflection under transfer loads and due to different cable profile. Deflections limits as per IS-1343. Effects of creep on deflection, crack widths.

UNIT-IV

Flexural and Shear Strength of Pre-stressed Concrete Sections: Types of flexural failure, IS code recommendations for flexure, Ultimate flexural strength of section. Shear and principal stresses, Ultimate shear resistance of pre-stressed concrete members, Shear reinforcement. Design of beams for flexure and shear as per IS code provisions.

UNIT-V

Transfer of Pre-stress in Pre tensioned Members and Anchorage Zone Stresses in Post Tensioned Members: Transmission of pre-stress in pre-tensioned members, Transmission length, Bond stresses, Codal provisions for bond and transmission length, Anchorage stress in post- tensioned member. Bearing stress and bursting tensile force, IS code provisions.

Learning Outcomes: Students will understand the general mechanical behavior of pre-stressed concrete, to analyze and design pre-stressed concrete flexural members.

Text Books:

1. Raju, N. K., "Pre-stressed concrete", Tata McGraw Hill, New Delhi, 1st Edition, 2012.
2. Ramamruthum, S., "Pre-stressed Concrete", Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2003.
3. Lin, T. Y., Burns, N. H., "Design of pre- stressed Concrete Structures", John Wiley and Sons. New York, 3rd Edition, 1981.

References:

1. Leonhardt.F. "Prestressed Concrete Design and Construction", Edition Wilhelm Ernst & Sohn, Berlin, 1964
2. Guyon .V. "Limit State Design of Prestressed Concrete", Applied Science Publishers, London 1995
3. Dayaratnam.P., "Prestressed Concrete", Tata McGraw Hill Publishing Co. New Delhi 2000.

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Course Title: **Matrix Method of Structural Analysis**			Course Code: CBA030
Credit: 4.0	L **4**	T **0**	P **0**
Year: 1st			Semester: I

Course Objectives: It is the prime responsibility of the structural engineer to ensure that the structures transmit the service loads safely and efficiently. In order to discharge this responsibility effectively, a clear understanding of structural response is essential. The objective of this course is to impart a clear and systematic picture of the forces and their effects on structural systems using Matrix Method of Structural Analysis.

Unit –I

Introduction, Types of loads, Compatibility Conditions, Static and Kinematic indeterminacy, Principle of Superposition, Stiffness and flexibility matrix in single, two and n-co-ordinates, Structures with constrained measurements, Energy Concepts & Transformation of Coordinates – Betti's Law and its Application.

Unit-II

Flexibility method applied to statically determinate and indeterminate structures- Choice of redundant, Application to various types of structures, Internal forces due to thermal expansion and lack of fit

Unit-III

Stiffness method- Basis of stiffness method, force-displacement relationships, Nodal Stiffness, Application to various types of structures, Internal forces due to thermal expansion and lack of fit.

Unit-IV

Introduction to Element Approach, Member stiffness matrix, Local or Member co-ordinate system, Global or structural co-ordinate system, Rotation of axes, Structure Stiffness matrix, Computer oriented stiffness method.

Unit-V

Analysis by substructure using the stiffness method and flexibility method with tri-diagonalization, Analysis by Iteration method, frames with prismatic members, non-prismatic members.

Learning Outcomes: This course would train an individual for the analysis of large ad important structures.

Text Books:

1. Mosche, F., Rubenstein, Matrix Computer Analysis of Structures, Prentice Hall, New York, 1966.
2. Kanchi, Matrix Structural Analysis, Wiley Eastern Ltd., New Delhi, 1981.
3. Rajasekaran S, Computational Structural Mechanics, Prentice Hall of India, New Delhi, 2001.
4. Analysis of Structures: D. J. Dawe.
5. Matrix Method of Structural Analysis: C.K. Wang.

References:

1. Pandit G.S. & Gupta, S.P. (2001), Structural Analysis (A matrix approach), Tata McGraw Hill Publishing Ltd.

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Course Title: **Advanced Concrete Laboratory**	Course Code: CBA110
Credit: **1.0**	L **0** T **0** P **2**
Year: **1st**	Semester: **I**

Course objective: To provide hands on training on advanced test methods on fresh and hardened concrete

List of Experiments

1. Tests on Cement –

a. Specific Gravity of Cement.

b. Standard Consistency of Cement.

c. Setting time of Cement.

d. Soundness of Cement.

e. Compressive Strength of Cement.

2. Tests on Aggregate –

a. Bulking of Fine Aggregate.

b. Specific Gravity of Fine & Coarse Aggregate.

3. IS Method of Mix Design for Normal Concrete.

4. Workability Tests on Fresh Properties of Normal concrete -

a. Slump Cone Test.

b. Compaction Factor Test.

c. Vee-Bee Consistometer Test.

5. Mix Design of Self Compacting Concrete (SCC).

6. Tests on Fresh Properties of SCC

7. Compressive strength of Concrete.

8. Flexure Testing of Beams.

9. Non Destructive Testing of Concrete

Learning outcome: Students will be trained in various experiments as per the relevant IS codes of practices.

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Course Title: **Finite Element Analysis**			Course Code: CBB010
Credit: 4**.0**	L **4**	T **0**	P **0**
Year: **1st**			Semester: **II**

Course Objectives: This course is designed to impart basic as well as comprehensive skills of structural analysis based on finite element method. To enable students to formulate the design problems into FEA.

UNIT I

Introduction, General description of method, FEM vs Classical method, need for studying FEM, Basic equation of elasticity, Equation of equilibrium, strain displacement equations, Linear constitutive laws

UNIT II

Finite element analysis of bar and trusses, Matrix displacement equations, Solution of Matrix displacement equations

UNIT III

Element- 1,2,3 dimensional, shapes- triangular, rectangular, tetrahedral, nodes, nodal unknowns and coordinate systems- global, local and natural, Discretization of structure, refining mesh, higher order element vs mesh refinement.

UNIT IV

Shape functions, polynomial shape functions, finding shape functions using polynomials and Lagrange polynomials

UNIT V

Finite element analysis of plane stress and plane strain problems, Isoparamatric formulation, Non-plinear analysis.

Learning Outcomes: Students will be able to identify mathematical models for the solution of common Engineering problems, formulate simple problems into finite elements, derive element matrix equations by different methods.

Text Books:

Finite Element analysis: S.S. Bhavikatti, New Age International Publishers

Introduction to Finite Elements in Engineering: T.R. Chandrupatla and A.D. Belegundu, Prentice Hall Publishers

Reference books:

Finite Element Structural Analysis: T.Y.Yang

Concepts and applications of Finite Element Analysis: Robert D. Cook.

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Course Title: **Advanced Reinforced Concrete Design**			Course Code: CBB020
Credit: 4**.0**	L **4**	T **0**	P **0**
Year: **1st**			Semester: **II**

Course Objectives: The primary objective of the course is to extend students' knowledge and proficiency in reinforced concrete structural design, analysis and special detailing

UNIT-I

Basic Design concepts: Review of limit state design of beams, Behavior in flexure, Design of singly Reinforced rectangular sections, Design of Doubly Reinforced rectangular sections; Design of flanged beam sections, Design for shear.

UNIT-II

Design of Reinforced Concrete Deep Beams: Steps of Designing Deep Beams, Design by IS 456, Checking for Local Failures, Detailing of Deep Beams.

UNIT-III

Slabs: Design of circular & flat slabs, Yield line analysis of slabs

UNIT - IV

Design of special RC elements: Design of slender columns, corbels & Edge (spandrel) Beams.

UNIT - V

Shear wall: Design and analysis of shear walls for framed buildings.

Learning Outcomes: Students will be able to develop structural member modeling and analyze structural members by developing small computer programs

Text Books:

1. Reinforced concrete design by s. unnikrishna Pillai & Menon, TMH.
2. Advanced Reinforced Concrete Design - PC Varghese Practice Hall 2008
3. Limit state theory and design of reinforced concrete by Dr. S.R. Karve and Dr V L Shah, Standard publishers, Pune, 3rd Edition 1994
4. Advanced concrete design, by N. Krishna raju, CBS Publishers and distributors, Delhi.

References:

1 .Reinforced concrete design by Kennath Leet, TMH.
2. Reinforced concrete structural elements - behaviour, Analysis and design by P' Purushotham' Tata Mc.Graw-Hill, 1994.
3. Design of concrete structures -Arthus H. Nilson, David Darwin, and chorles w' Dolar, Tata Mc' Graw-Hill, 3'd Edition, 2005.
4. Reinforced concrete structures, Vol.l, by B.c.Punmia, AshokKumar Jain and Arun Kumar Jain, Laxmi Publications, 2004.
5. Reinforced concrete structures - l.C' Syal & A'K Goel' S' Chand' 2004'.

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Course Title: **Solid Mechanics**			Course Code: CBB610
Credit: **4.0**	L **4**	T **0**	P **0**
Year: **1st**			Semester: **II**

Course Objective: To solve advanced solid mechanics problems using classical methods and to apply commercial softwares on selected applied soild mechanics problems.

Unit 1

Analysis of Stress and Strain: Analysis of stress and strain, stress-strain relationship. Generalized Hook's law. Plane stress and plain strain.

Unit 2

2D Problems: two dimensional problems in Cartesian and polar co-ordinates for simple problems.

Unit 3

Torsion: Torsion of non-circular sections: methods of analysis- membrane analogy- torsion of thin rectangular and hollow thin walled sections.

Unit 4

Energy methods: Energy methods: Principles of virtual work- energy theorm- Rayleigh-Ritz method- Finite difference method.

Unit 5

Introduction to problem in Plasticity: Physical assumptions – criterion of yielding, yield surface, Flow rule (Plastic stress and strain relationship). Elastic plastic problems of beams in bending – plastic torsion.

Learning Outcomes: To understand the theory of elasticity, to solve for stresses and deflection of beams and to apply various failure criteria.

Text Books:

1. Timoshenko, S. and Goodier T.N., Theory of Elasticity, McGraw–Hill Ltd., Tokyo, 1990.
2. Chenn, W. P and Henry D. J., Theory of Elasticity, D.J., SpringerVerlac, New York, 1988
3. Sadhu Singh, Theory of Elasticity, Khanna Publishers, New Delhi 1988.

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Course Title: **Foundation Engineering**			Course Code: CBB620
Credit: **4.0**	L **4**	T **0**	P **0**
Year: **1st**			Semester: **II**

Course Objective: This course is designed to comprehend and utilize geotechnical literatures to establish the framework for foundation design.

Unit 1

Site investigation & exploration, location, depth of bore holes and bore log chart. Penetrometer tests, pressure meter tests, geophysical methods.

Unit 2

Shallow foundations: Introduction, various bearing capacity theories, settlement of shallow foundation. I.S .Code on structural safety of foundations, Allowable total and differential settlements.

Unit 3

Earth pressure at rest, active and passive earth pressures, Earth pressure theories: Rankine, Coulumb, Culmann.

Unit 4

Pile Foundations: Type of Piles, Load test on piles, DynamicFormula, StaticFormula. Group action of piles, clays-settlement and bearing capacity, I.S.Codes of piles. Behaviour of pile under lateral loading-Winkler's assumptions and theoryof beam on elastic foundations.

Unit 5

Sheet piles and Bulk Heads. Under Pinning of Foundations. Well foundation, Tilts and shifts in wells.

Learning Outcomes: To plan and implement site investigation programs including subsurface exploration to evaluate soil behavior and to obtain necessary design parameters.

Text Books:

1. Gopal Ranjan and Rao A.S.R., "Basic and applied soil mechanics", New Age International (P) Limited, Publishers, New Delhi
2. Bowels, Joseph E.(1996). Practical Foundation Engineering Handbook. 5th edition, McGraw-Hill, New York.
3. Das, Braja M. (1999). Principles of foundation Engineering, 4th edition, PWS publishing, Pacific Grov. Calif.
4. Praksh, Shamsher, and Sharma, Hari D. (1990). Pile foundation in Engineering Practice, John Wiley & Sons, New York.
5. Varghese, P.C. (2005). Foundation Engineering Prentice –Hall of India Pvt. Ltd. New Delhi-001.

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Course Title: **Soil Structure Interaction**			Course Code: CBB630
Credit: **4.0**	L **4**	T **0**	P **0**
Year: **1st**			Semester: **II**

Course Objective: The aim of the course is to provide the students an understanding of effectively simulating the soil structure interaction problems using computer application and realistic material models.

UNIT 1

Soil foundation Interaction: Introduction to soil foundation interaction problems, soil behaviour, foundation behaviour, interface behaviour, scope of soil foundation interaction analysis, soil response models, Winkler, Elastic continuum, two parameter elastic model, Elastic Plastic behaviour, Time dependent behaviour.

UNIT 2

Beam on Elastic foundation-soil models:

Infinite beam, two parameters, Isotropic elastic half space, analysis of beams of finite length, classification of finite beams in relation to their stiffness.

UNIT 3

Plate on Elastic medium:

Infinite plate, Winkler, two parameters, isotropic elastic medium, thin and thick plates, analysis of finite plates: rectangular and circular plates, Numerical analysis of finite plates, simple solutions.

UNIT 4

Elastic analysis of piles:

Elastic analysis of single pile, theoretical solutions for settlement and load distributions, analysis of pile group, interaction analysis, load distribution in groups with rigid cap.

UNIT 5

Laterally loaded pile:

Load deflection prediction for laterally loaded piles, sub-grade reaction and elastic analysis, interaction analysis, pile raft system, solution through influence charts.

Learning Outcomes: At the end of the course students are expected to learn basics of finite difference and finite element analysis and realistic material models for structural materials, soils and interface.

Text Books:

1. Elastic analysis of soil foundation interaction By Selva durai, A.P.S.
2. Pile Foundation Analysis and Design By Poulos, H.G. & Davis E.H.
3. Foundation Analysis By Scott, R.F.
4. Structure Soil Interaction- State of Art Report, Institution of Structural Engineers, 1978, Geotechnical Earthquake Engineering By Kramer, S.L

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Course Title: **Design of Steel and composite structures**			Course Code: CBB640
Credit: **4.0**	L **4**	T **0**	P **0**
Year: **1st**			Semester: **II**

Course Objective: To understand the fundamentals of designing steel structures and relevant codes of practices

UNIT 1

Design of members subjected to lateral loads and axial loads - Principles of analysis and design of Industrial buildings and bents - Crane gantry girders and crane columns – Analysis and design of steel towers - Design of industrial stacks - Self supporting and guyed stacks lined and unlined.

UNIT 2

Types of connections, Design of framed beam connections, Seated beam connection, Unstiffened, Stiffened Seat connections, Continuous beam – to - beam connections and continuous beam–to–column connection both welded and bolted.

UNIT 3

Cold formed Steel Sections - Types of cross sections - Local buckling and post buckling - Design of compression and Tension members - Beams - Deflection of beams – Combined stresses and connections.

UNIT 4

Introduction to composite design – shear connectors – types of shear connectors – degrees of shear connections – partial and full shear connections – composite sections under positive bending – negative bending – propped conditions – un-propped conditions – deflection of composite beams.

UNIT 5

Composite slabs – profiled sheeting – sheeting parallel to span – sheeting perpendicular to span - Types of Composite columns – design of encased columns – design of in-filled columns – axial, uni-axial and bi-axially loaded columns. Composite shear wall – double skinned composite deck panels – composite trusses – composite frames – composite plate girders.

Learning Outcomes: At the end of the course students will be able to design steel structures.

Text Books:

1. Arya, A.S., Design of Steel Structures, New Chand & Brothers, New Delhi 1982.

2. R.P. Johnson, "Composite Structures of Steel & Concrete", Blackwell Scientific publications, UK.

3. Duggal S K., Design of Steel Structures, Tata McGraw-Hill Education

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Course Title: **Seismic Design of Structures**			Course Code: CBB650
Credit: **4.0**	L **4**	T **0**	P **0**
Year: **1st**			Semester: **II**

Course Objective: To understand the fundamentals of designing structures subjected to earthquake loading and the relevant codes of practice.

UNIT I

Engineering Seismology: Earthquake phenomenon cause of earthquakes- Faults – plate seismic tectonics- waves- Magnitude/Intensity – Energy released- Earthquake measuring instruments- Seismic zones in India – Review of damage in past earthquakes.

UNIT II

Conceptual design: Introduction – Twisting of buildings – Ductility – Seismic design requirements – regular and irregular configurations – basic assumptions – design earthquake loads – basic load combinations – seismic methods of analysis – factors in seismic analysis – Equivalent load method – Response spectrum method – Time history method.

UNIT III

Reinforced concrete buildings: Principles of earthquake resistant design of RC members- structural models for frame buildings- seismic methods of analysis - seismic design methods- IS code based methods for seismic design – seismic evaluation and retrofitting – Lateral load resisting systems – Determination of design lateral forces – Lateral distribution of base shear – Base Isolation Techniques

UNIT IV

Masonry Buildings: Introduction – Elastic properties of masonry assemblage – Categories of masonry buildings – Behavior of unreinforced and reinforced masonry walls – Improving seismic behavior of masonry buildings - Seismic design requirements - Lateral load analysis of masonry buildings.

UNIT V

Ductility Consideration of Earthquake resistant design of RC Buildings: Introduction – Impact of ductility- Requirements of ductility- Assessment of ductility – Factors affecting ductility – Ductile detailing considerations as per IS 13920. Behavior of beam, columns and joints in RC buildings during earthquakes – Vulnerability of open ground story and short columns during earthquakes.

Learning Outcomes: Students will be able to design Earthquake resistant structures

Text Books:

1. Earthquake Resistant Design of structures - S. K. Duggal, Oxford University Press
2. Earthquake Resistant Design of structures - Pankaj Agawal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd.
3. Seismic Design of Reinforced Concrete and Masonry Building -T Paulay and M.J.N. Priestly, John Wiley & Sons

Reference:

1. Masory and Timber structures including earthquake Resistant Design -Anand s.Arya, Nem chand & Bros

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Course Title: **Ground Improvement Techniques**			Course Code: CBB660
Credit: **4.0**	L **4**	T **0**	P **0**
Year: **1st**			Semester: **II**

Course Objective: To understand the fundamentals of different ground improvement methods and its applications to civil Engineering structures.

UNIT 1:

Dewatering and Drainage Mechanism: Introduction- Scope and necessity of Ground improvement in geotechnical engineering, Classification of Ground Improvement Technique; Basic concepts of Drainage- Groundwater and Seepage control, Methods of Dewatering System, Drains.

UNIT 2:

Compaction and Vertical Drain: Introduction, Methods of compaction, Moisture-Density relationship, engineering behaviour of compacted fine- grained soils, Compaction control tests, liquefaction of soils and its remedial measures; Compressibility of soil and consolidation; preloading methods, concepts of vertical drains.

UNIT 3:

Grouting and Stabilization: Grouting- types of grout, aspects of grouting, grouting procedure, field equipment, application, requirements of soil stabilization, mechanical stabilization, Portland cement stabilization, bituminous (cementing) stabilization, chemical stabilization, thermal methods of stabilization.

UNIT 4:

Geosynthetics: Introduction, geosynthetic types, properties of geosynthetics, application of geosynthetics.

UNIT 5:

Soil reinforcement: Ground anchors, components of anchor, rock bolt, soil nailing, types of failure of soil nailed walls, stone columns, sand columns, soil-lime columns, Application of soil reinforcement in ground improvement.

Learning Outcomes: Students will be able to appreciate the advantages ground improvement methods from structural Engineering perspective

Text Books

1. Orlando B. A. (1994). "Introduction To Frozen Ground Engineering", CHAPMAN & HALL, NEW YORK.
2. "Ground Engineering". The Institute of Civil Engineers, London, 1970
3. Rawlings,C G, Hellawell,E. E. and Kilkenny,W. M.(2000). "Grouting For Ground Engineering ", CIRIA, LONDON

Reference Books

- Koerner, R. M. (1990). "Designing With Geosynthetics", PRENTICE-HALL.
- Wood, I. R. (1982). "Vertical Drains", THOMAS TELFORD.
- Davics, M. C. and Schlosser, F. (1997). "Ground Improvement Geosystems", THOMAS TELFORD, London
- Moseley, M. P. (1993). "Ground Improvement", BLACKIE ACADEMIC & PROFESSIONAL, LONDON.
- Hausmann, M. R.(1990). "Principles of Ground Modifications", McGraw-Hill Singapore.
- Som, N & Das, S. P(2003). "Theory and practice of Foundation Design", Eastern Economy Edition, India.

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Course Title: **Structural Dynamics**			Course Code: CBB670
Credit: **4.0**	L **4**	T **0**	P **0**
Year: **1st**		Semester: **II**	

Course Objective: The objective of this course is to develop fundamental concepts of structural behavior under dynamic loading conditions.

UNIT 1

Introduction to Dynamic analysis - Elements of vibratory systems and simple Harmonic Motion- Mathematical models of SDOF systems - Principle of Virtual displacements - Evaluation of damping resonance.

UNIT 2

Fourier series expression for loading - (blast or earthquake) - Duhamel's integral – Numerical methods - Expression for generalised system properties - vibration analysis Rayleigh's method - Rayleigh - Ritz method.

UNIT 3

Evaluation of structural property matrices - Natural vibration - Solution of the Eigen value problem - Iteration due to Holzer and Stodola Idealisation of multi-storeyed frames - analysis to blast loading - Deterministic analysis of earthquake response - lumped SDOF system

UNIT 4

Differential equation of motion - Beam flexure including shear deformation and rotatory inertia - Vibration analysis using finite element method for beams and frames

Learning outcomes: This course will provide clear understanding of single degree and multi degree freedom systems. This will be helpful in the analysis and design of the structures under dynamic loading conditions like seismic load.

Text Books

1. Mario Paz, and William Leigh, Structural Dynamics, CBS, Publishers, 1987.

2. Roy R Craig, Jr., Structural Dynamics, John Wiley & Sons, 1981.

3. A.K. Chpora "Dynamics of Structures Theory and Application to Earthquake Engineering" Pearson Education, 2001.

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Course Title: **Construction Techniques and Management**			Course Code: CBC610
Credit: **4.0**	L **4**	T **0**	P **0**
Year: **2nd**		Semester: **III**	

Course Objective: To understand the construction techniques and equipment for effective construction and to explain the fundamentals of quality and safety in construction industry.

UNIT 1

Construction planning-Construction facilities, Schedules, Layout of Plant utilities, Construction methods: Excavation and handling of Earth and Rock; Production and handling of Aggregates and Concrete , cooling of concrete in dams.

UNIT 2

Factors affecting selection of equipment - technical and economic, construction engineering fundamentals, Analysis of production outputs and costs, Characteristics and performances of equipment for Earth moving, Erection, Material transport etc.

UNIT 3

Introduction to quality. Planning and control of quality during design of structures. Quantitative techniques in quality control. Quality assurance during construction. Inspection of materials and machinery. Quality standards/codes in design and construction. Concept and philosophy of total quality management (TQM). Training in quality and quality management systems (ISO-9000).

UNIT 4

Building Maintenance: Scheduled and contingency maintenance planning. Management Information System (MIS) for building maintenance. Maintenance standards. Economic maintenance decisions.

UNIT 5

Concrete Construction methods: form work design and scaffolding, slip form and other moving forms, pumping of concrete and grouting mass concreting (roller compacted concrete), ready mixed concrete, various methods of placing and handling concrete, Accelerated curing, Hot and cold weather concreting, Under water concreting, Pre-stressing.

Learning Outcomes: Students will develop a keen acumen for quality constructions with due regards to safety and economy.

Text Books:

1. Peurifoy, R.L. and Ledbetter, W.B.; Construction Planning, Equipment and Methods, McGraw Hill Singapore, 1986.

2. Robertwade Brown; Practical Foundation Engineering Handbook, McGraw Hill Publications, 1995.

3. Joy, P.K.; Total Project Management- The Indian Context, New Delhi, MacMillan India Ltd., 1992.

4. Uliman, John.E, et al; Handbook of Engineering Management, Wiley, New York , 1986.

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Course Title: **Bridge Engineering**			Course Code: CBC620
Credit: **4.0**	L **4**	T **0**	P **0**
Year: **2nd**			Semester: **III**

Course Objective: To develop fundamental concepts of analysis and design of bridge structures.

UNIT-I
Introduction: Types of Bridges-Economic span length-Types of loading- Theories of Lateral Load distribution -Frictional resistance of expansion bearings-Secondary Stresses-Temperature Effect-Erection Forces and effects- Standard specifications for road and railway bridges -General Design Requirements.

UNIT-II
Solid slab Bridges: Introduction-Method of Analysis and Design.

UNIT-III
Girder Bridges:-Introduction-Method of Analysis and Design- Courbon's Theory Grillage analogy

UNIT-IV
Pre-Stressed Concrete Bridges: Pretensioned and post tensioned concrete bridges; analysis of section for flexure, shear and bond; losses in prestress, deflection of girder; partial prestressing; analysis and design of anchorage block; box girder bridge

UNIT-V
Abutment and piers: scour at abutment and piers; types of foundations; analysis for stresses and design; introduction to soil-structure interaction.

Learning Outcomes: Students will be able to explain the components of Bridges, analyze and designs Bridges.

Texts
1. D. J. Victor, Essentials of Bridge Engineering, Oxford IBH, 1980.
2. V. K. Raina, Concrete Bridge Practice Analysis Design and Economics, Tata McGraw Hill, 2nd Ed, 1994.
3. Design of concrete Bridges by M.G.Aswani, V.N.Vazirani and M.M.Ratwani.

References
1. N. Rajagopalan, Bridge Superstructure, Narosa Publishing House, 2006.
2. W. F. Chen and L. Duan, Bridge Engineering Handbook, CRC press, 2003.
3. B. Bakht and L.G. Jaeger, Bridge Analysis Simplified, McGraw Hill, 1987.
4. E. J. O'Brien, and D. L. Keogh, Bridge Deck Analysis, Taylor and Francis, 1999.
5. H. Eggert and W. Kauschke, Structural Bearings, Ernst & Sohn, 2002.
6. T. Y. Lin and N. H. Burns, Design of Prestressed Concrete Structures, John Wiley and Sons, 1981.

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Course Title: **Design of Tall Buildings**			Course Code: CBC630
Credit: **4.0**	L **4**	T **0**	P **0**
Year: **2nd**			Semester: **III**

Course Objectives: Objective of this course is to train a post graduate student for analysis and design of tall buildings. The course content deals with the analytical techniques having potential to solve the complex forms of tall buildings. More emphasis is given on the fundamental approaches to the analysis of the behaviour of different forms of tall biding structures including framed system, shear wall system etc.

UNIT I

Introduction - Classification of buildings according to NBC – Types of loads – wind load – Seismic load – Quasi static approach.

UNIT II

Plane Frame System - Calculation of wind load – Approximate method – Portal -Cantilever and factor methods – Kani's method – Substitute frame method for dead load and live loads.

UNIT III

Shear Wall System - Rosman's analysis – Design aspect – RC frame and shear wall interaction – Equivalent frame method.

UNIT IV

In-filled Frame Systems - Importance – Methods of analysis – Equivalent truss and frame method – Force-displacement method – Effect of perforation in the in-filled frame.

UNIT V

Overall buckling analysis of frames: Wall – frames–second order effects of gravity of loading–simultaneous first order and P-delta analysis Translational - torsional instability, out of plum effects.

Learning Outcomes: This Course would prove to be very useful for all structural engineering students whether they are heading for design industry or construction industry or even for academics. The course content spans from basic concept of structural analysis to the highly advanced methods involve in analysis of complex structural forms.

Text Book:

1. Bryan Stafford smith and Alex coull, Tall Building Structures – Analysis and Design, John Wiley & sons, 2006.
2. Ramachandra (2005), Design of Steel Structures–Vol.II, Standard Book House, 1750, Nai Sarak, delhi-6.

Reference Books:

1 Sarwar Alam Raz, (2001), Analytical methods in Structural Engineering, Wiley Eastern Private Limited, New Delhi.
2. Ghali.A., Neville.A.M and Brown.T.G, (2003), Structural Analysis – A unified classical and Matrix Approach (Fifth Edition), Span press.

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Course Title: **Design of Reinforced Concrete Foundations**			Course Code: CBC640
Credit: **4.0**	L **4**	T **0**	P **0**
Year: **2nd**			Semester: **III**

UNIT-I

Basic Design concepts: Review of limit state design of beams, Behavior in flexure, Design of singly Reinforced rectangular sections, Design of Doubly Reinforced rectangular sections; Design of flanged beam sections, Design for shear.

UNIT-II

Design of Reinforced Concrete Deep Beams: Steps of Designing Deep Beams, Design by IS 456, Checking for Local Failures, Detailing of Deep Beams.

UNIT-III

Slabs: Design of circular & flat slabs, Yield line analysis of slabs

UNIT - IV

Design of special RC elements: Design of slender columns, corbels & Edge (spandrel) Beams.

UNIT - V

Shear wall: Design and analysis of shear walls for framed buildings.

Text Books:

1. Reinforced concrete design by s. unnikrishna Pillai & Menon, TMH.
2. Advanced Reinforced Concrete Design - PC Varghese Practice Hall 2008
3. Limit state theory and design of reinforced concrete by Dr. S.R. Karve and Dr V L Shah, Standard publishers, Pune, 3rd Edition 1994
4. Advanced concrete design, by N. Krishna raju, CBS Publishers and distributors, delhi.

References:

1 .Reinforced concrete design by Kennath Leet, TMH.
2. Reinforced concrete structural elements - behaviour, Analysis and design by P' Purushotham' Tata Mc.Graw-Hill, 1994.
3. Design of concrete structures -Arthus H. Nilson, David Darwin, and chorles w' Dolar, Tata Mc' Graw-Hill, 3'd Edition, 2005.
4. Reinforced concrete structures, Vol.l, byB.c.Punmia, AshokKumar Jain and Arun Kumar Jain, Laxmi Publications, 2004.
5. Reinforced concrete structures - l.C' Syal & A'K Goel' S' Chand' 2004'.

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Course Title: **Maintenance and Rehabilitation of Structures**			Course Code: CBC650
Credit: **4.0**	L **4**	T **0**	P **0**
Year: **2nd**			Semester: **III**

Course Objective: To develop the skills to understand the techniques of retrofitting of structural Element

UNIT I

Serviceability and Durability of Structures - Quality Assurance for concrete construction - Fresh Concrete properties – Strength – Permeability - Cracking - Effects due to climate – Temperature – chemicals - Wear and erosion - Design and construction errors - Corrosion mechanism - Effects of cover thickness and cracking - Methods of corrosion protection – Inhibitors - Resistant steels – Coatings - Cathodic protection

UNIT II

Diagnosis and Assessment of Distress - Visual inspection – Non destructive tests – Ultrasonic pulse velocity method – Rebound hammer technique – ASTM classifications – Pullout tests – Core test.

UNIT III

Materials for Repair - Special concretes and mortar - Concrete chemicals – Special elements for accelerated strength gain - Expansive cement - Polymer concrete – Ferro cement, Fibre reinforced concrete - Fibre reinforced plastics.

UNIT IV

Techniques for Repair - Rust eliminators and polymers coatings for rebars during repair - Foamed concrete - Mortar and dry pack - Vacuum concrete - Gunite and shotcrete - Epoxy injection - Mortar repair for cracks - Shoring and underpinning.

UNIT V

Rust eliminators and polymers coating for rebars during foamed concrete, mortar repair for cracks, shoring and underpinning- Repairs to overcome low member strength – Deflection – Cracking -Chemical disruption - Weathering wear - Fire leakage – Marine exposure.

Learning Outcome: At the end of the course students will have in depth knowledge of retrofitting of various structures.

Text books

1. Raikar, R.N., Learning from failures – Deficiencies in Design, Construction and Service –R&D Centre (SDCPL), Raikar Bhavan, 1987.

2. Allen R.T., and Edwards S.C, Repairs of Concrete Structures, Blaike and Sons, U.K.1987.

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Course Title: **Optimization in Structural Design**			Course Code: **CBC660**
Credit: **4.0**	L **4**	T **0**	P **0**
Year: **2nd**			Semester: **III**

Course Objective: To study the fundamentals of simulation as applicable in Civil Engineering structures.

UNIT-I

Introduction to optimization: Introduction - Historical developments – Engineering applications of optimization - classification of optimization problems - Optimization Techniques. Optimization by calculus - treatment of equality constraints _ Extension to multiple equality constraints - Optimization with inequality constraints - The generalized Newton-Raphson method.

UNIT-II

Linear Programming: Introduction - Applications - standard form of a linear programming- Geometry of linear programming problems - Solution of a system of Linear simultaneous equations - pivotal reduction of a general system of equations - Motivation of the simplex Method - simplex Algorithm

UNIT-III

Non-Linear Programming: Introduction - Unimoial Function - unrestricted search - Exhaustive search - Dichotomous search - Interval Halving method _ Fibonacci method - Golden section method - comparison of elimination methods _ Unconstrained optimization techniques - Direct search methods - Random search methods _ grid search method - Univariate method - Powell's method - simplex method – Indirect search methods - Gradient of a function - steepest descent method - conjugate gradient - Newton's method.

UNIT-IV

Dynamic Programming: Introduction - Multistage decision processes - concept of suboptimization and the principle of optimality - computational procedure in dynamic programming - example illustrating the Calculus method of solution - example illustrating the tabular of solution - conversion of a final value problem into an initial value problem - continuous dynamic programming.

UNIT-V

Network Analysis: introduction - Elementary graph theory - Network variables and problem types - Minimum-cost route - Network capacity problems - Modification of the directional sense of the network -

Application of optimization techniques to Trusses, Beams and Frames.

Learning outcomes: To understand the theory of optimization methods and algorithms developed for solving various types of optimization problems.

Text Books:

1. Optimization: Theory and Applications by S.S. Rao.
2. Numerical optimization Techniques for Engineering Design with applications by G.N.Vanderplaats.
3. Introduction to Optimum Design by J.S.Arora

References:

1. Elements of Structural Optimization by R.T.Haftka and Z.curdal.
2. Optimum Structural Design by U.Kirsch.
3. Optimum Design of Structures by K.l.Majid.

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Course Title: **Hydraulic Structures**			Course Code: **CBC670**
Credit: **4.0**	L **4**	T **0**	P **0**
Year: **2nd**			Semester: **III**

Course Objective: The primary objective of the course is to impart the knowledge of the advanced design concepts of hydraulic structures.

UNIT I

Investigation and Planning -Preliminary investigations and preparation of reports, Layout of projects, Geological and hydrological investigations.

UNIT II

Analysis and Design of Dams - Earthen Dam and Gravity Dam.

UNIT III

Analysis and Design of Arch Dam, Infiltration Gallery, Collector wells.

UNIT IV

Construction of Dams - Masonry, Concrete and Earthen Dams, Foundation for Dams – Principles of Foundation treatment, Grouting methods.

UNIT V

Design of Weirs on Permeable foundation - Creep theory, Potential theory, Flow nets, design of weirs - Khosla's theory.

Learning Outcome: At the end of the course students will be able to design different types of dams and weirs.

Text book

1. Creager, W.P. Justin D, and Hinds, J., Engineering for Dams Vol. I, II and III.

2. Kushalani, K.B., Irrigation (practice and design) Vol. III and IV.

3. Nalluri C., " Hydraulic Structures" Taylor & Francis, 2001

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Course Title: **Dynamics of Earth and Environment**	Course Code: **CBC680**		
	L	T	P
Credit: **4.0**	**4**	**0**	**0**
Year: **2nd**	Semester: **III**		

Course Objective: To understand the fundamentals of various Earth processes and dynamic relations between various physical processes among different Environmental parameters.

UNIT 1:

Fundamentals of Atmospheric circulations: Atmosphere and it structure, Vertical profile, lapse rate, moving coordinate system, El Nino-La Nina events, Walker circulation, Madden Julian Oscillation, concepts of land sea breezes, cyclones and their formation, Indian Monsoon, Paleoclimate,

UNIT 2:

Ground water and Engineering geology: Different types of aquifers, groundwater equations, Darcy‟s Law, porosity, permeability, soil types, stress, strain, artificial recharge, rainwater harvesting, Infiltration gallery, rock strength measurements.

UNIT 3:

Ocean dynamics: Ocean physical properties, Navier stokes' equations, stability, Brunt Vaissala frequency, concept of tides, Indian Ocean dipole, global ocean currents, Western boundary currents. Planetary waves. Barotropic and baroclinic waves, Geopotential. Tsunami.

UNIT 4:

Stratigraphy and basin analysis: Concepts and principles, Lithostratigraphy, Tectonic subsidence, basin forming processes, basin margins, Various logging tools and log characteristics.

UNIT 5:

Remote sensing and Isotope geology: Electromagnetic spectrum, synthetic aperture radar, active and passive sensors, radar technology, Sensor characteristics, different dating methods, carbon dating, optical luminescence dating, corrections

Learning Outcomes: Students will be able to gain the core concepts of natural forces, disasters, causes and effects. Also they will be able to learn various numerical equations that govern the physical forces.

Text book

Navale Pandharinath, C. K. Rajan, "Earth and Atmospheric Disasters Management Natural and Man-Made"

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COURSE STRUCTURE

OF

M.TECH. IN

CONSTRUCTION ENGINEERING & MANAGEMENT

BATCH 2016 – 18

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Year: 1st **Semester: I**

Course Code	Course Title	L	T	P	Credit
CEM 101	Principles of Management	2	2	0	3
CEM 102	Project Planning & Scheduling	3	2	0	4
CEM 103	Research Methodology	1	1	1	2
CEM 104	Construction Equipment & Management	2	0	2	3
CEM 105	Environmental Management and Impact Assessment	3	2	0	4
	Total				**16**

Year: 1st **Semester: II**

Course Code	Course Title	L	T	P	Credit
CEM 201	Project Formulation & Appraisal	3	2	0	4
CEM 202	New Building Materials & Technology	2	2	0	3
CEM 203	Resource Management in Construction	2	1	1	3
CEM 204	Building Contract Administration	2	2	0	3
CEM 205	Computer Applications & Technology	2	0	4	4
CEM 206	Summer Training	-	-	-	**5**
					22

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Year: 2nd **Semester: III**

Course Code	Course Title	L	T	P	Credit
CEM 301	Project Finance Management	4	0	0	4
CEM 302	Project Risk Management	3	0	0	3
CEM 303	Smart Buildings & Associated Technologies	3	0	0	3
CEM 304	Building Energy Efficiency Codes	3	0	0	3
CEM 305	Disaster Management	3	0	0	3
CEM 306	Industrial Visit	0	0	8	4
	Total				**20**

Year: 2nd **Semester: IV**

Course Code	Course Title	L/S	T	P	Credit
CEM 401	Thesis Project	16	0	0	16
CEM 402	Project Quality & Safety	0	0	2	2
	Elective-1	0	0	2	2
	Total				**20**

CEM 403	PPP in Construction Sector
CEM 404	Real Estate Management
CEM 405	Energy Management & Audit
CEM 406	Smart Cities

Summary of the Credits

Year	Semester	Credit	Year Credit
First Year	**I**	**16**	**38**
	II	**22**	
Second Year	**III**	**20**	**40**
	IV	**20**	

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Course Title: Principles of Management			Course Code: CEM101
Credit: 3	L	T	P
	2	**2**	**0**
Year: 1st			Semester: I

UNIT I: INTRODUCTION TO MANAGEMENT

What is Management? It's Need ,Importance & Purpose, Evolution of Managements thought, Different Schools/ approaches to Management: Behavioral, Quantitative, Systems, Contingency Approach

UNIT II: CONSTRUCTION MANAGEMENT

Nature of Construction Industry, Role of Architects and Engineer, Special characteristics of Construction activity, their Influence on Construction Managements, Development of Construction Management, Scope of Construction Management Project Management, Contracts Managements functions of Construction Managements

UNIT III: PROJECT MANAGER & MANGEMENT PLANNING

Managing projects vis-à-via Managing Routine activities, Qualities of Project Manager, Selection of Project Manager, Training for a Project Manager, What is planning? Importance of Planning, Types of Planning, levels of Planning, Strategies, Policies, Procedure, and Rules etc. in the context of Planning

UNIT IV: ORGANIZING

Organizing as a Management process, Principles of Organization, Different Structures of organizations such as line, Line & Staff, Functional, Matrix or project Organization: Characteristics, Features, their Merits and Limitation, Ownerships of Organization: Sole Proprietorship, Partnership, Private Ltd., Public Ltd. . Introduction to Organizational climate, Decision Making, Group Decision Making, Staffing: What is Staffing? Steps involved in Staffing, Recruitment, Staffing, Performance Appraisal Development

UNIT V: LEADING & CONTROLLING

Leadership Characteristics, Entrepreneur, Leader And Manger Distinguished, Motivation, Managing Conflicts, Leadership Traits And Styles, Different Approaches To Leadership, Controlling as a Management function, Direct and Indirect Control, Elements of Control, Prerequisites for Effective Control.

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Course Title: **Project Planning & Scheduling**	Course Code: CEM102
Credit: 4	L T P **3 2 0**
Year: 1st	Semester: I

UNIT I: CONSTRUCTION PROJECT PLANNING

Basic Concepts in the Development of Construction Plans, Choice of Technology and Construction Method, Defining Work Tasks, Defining Precedence Relationships among Activities, Estimating Activity Durations, Estimating Resource Requirements for Work Activities, Coding Systems

UNIT II: SCHEDULING PROCEDURES & TECHNIQUES

Construction Schedules, Critical Path Method, Scheduling Calculations, Float, Presenting Project Schedules, Scheduling for Activity-on-Node and with Leads, Lags, and Windows, Scheduling with Resource Constraints and Precedence, Use of Advanced Scheduling Techniques, Scheduling with Uncertain Durations, Calculations for Monte Carlo Schedule Simulation, Crashing and Time/Cost Trade-offs, Improving the Scheduling Process

UNIT III: COST CONTROL MONITORING & ACCOUNTING

The Cost Control Problem, The Project Budget, Forecasting for Activity Cost Control, Financial Accounting Systems and Cost Accounts, Control of Project Cash Flows, Schedule Control, Schedule and Budget Updates, Relating Cost and Schedule Information

UNIT IV: QUALITY & SAFETY CONTROL

Quality and Safety Concerns in Construction, Organizing for Quality and Safety, Work and Material Specifications, Total Quality Control, Quality Control by Statistical Methods

UNIT V: ORGANIZATION & USE OF PROJECT INFORMATION

Types of Project Information, Accuracy and Use of Information, Computerized Organization and Use of Information, Organizing Information in Databases

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Course Title: **Research Methodology**	Course Code: CEM103
Credit: 2	L T P **1 1 1**
Year: 1st	Semester: I

UNIT I: INTRODUCTION TO RESEARCH

Meaning of research, objectives of research, basic research issues and concepts, types of research: descriptive, analytical, fundamental and applied, quantitative, qualitative, Scientific methods in research, Research Process: Elements of Research process, Identification and Formulation of research problem, research question, need for defining a problem, process and technique to define a problem, role of a hypothesis, null and alternative hypothesis

UNIT II: RESEARCH DESIGN

Meaning and need of Research Design, Characteristics of a good Research Design, Types of Research Design, concept of variable, types of variable: dependent, independent, extraneous, confound relationship

UNIT III: SAMPLING DESIGN & MEASUREMENT IN RESEARCH

Implications of sampling design, characteristics of a good sample, probability sampling, non-probability sampling, sampling error, Concept of measurement, problems in measurement: validity and reliability, measurement scales

UNIT IV: DATA COLLECTION & ANALYSIS

Types of data, Methods of data collection- From primary sources: observation and recording, interviews structured and unstructured, questionnaire, open ended and close ended questions and the advantages, sampling- Problems encountered in collecting data from secondary sources, introduction to various data analysis techniques

UNIT V: DATA INTERPRETATION & REPORT WRITING

Research writing in general- Components: referencing- writing the bibliography- developing the outline- presentation; etc

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Course Title: **Construction Equipment & Management**	Course Code: CEM104
Credit: 3	L T P **2 0 2**
Year: 1st	Semester: I

UNIT I: EQUIPMENTS FOR EARTHWORK

Fundamentals of Earth Work Operations, Earth Moving Operations, Types of Earth Work Equipment, Tractors, Motor Graders, Scrapers, Front end Waders – Dozer, Excavators, Rippers, Loaders, trucks and hauling equipment, Compacting Equipment, Finishing equipment.

UNIT II: EQUIPMENTS FOR CONSTRUCTION

Equipment for Dredging, Trenching, Drag line and clamshells, Tunneling – Equipment for Drilling and Blasting - Pile driving Equipment - Erection Equipment - Crane, Mobile crane - Types of pumps used in Construction - Equipment for Dewatering and Grouting – Equipment for Demolition.

UNIT III: MATERIALS HANDLING EQUIPMENTS

Forklifts and related equipment - Portable Material Bins – Material Handling Conveyors – Material Handling Cranes- Industrial Trucks

UNIT IV: ASPHALT & CONCRETE PLANTS

Aggregate production, Different Crushers, Feeders, Screening Equipment, Handling Equipment, Batching and Mixing Equipment, Pumping Equipment, Ready mix concrete equipment, Concrete pouring equipment. Asphalt Plant, Asphalt Pavers, Asphalt compacting Equipment

UNIT V: EQUIPMENT MANAGEMENT

Identification, Planning of equipment, Selection of Equipment, Equipment Management in Projects, Maintenance Management, Equipment cost, Operating cost, Cost Control of Equipment, Depreciation Analysis, Replacement of Equipment

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Course Title: **Environmental Management and Impact Assessment**	Course Code: CEM105
Credit: 4	L T P **3 2 0**
Year: 1st	Semester: I

UNIT I: ENVIRONMENTAL IMPACT ASSESMENT

Introduction, Definitions & Concepts, Rationale & Historical Development of EIA

UNIT II: COMPONENTS OF EIA

Initial Environment Examination, Environment Impact Statement, Environmental Appraisal, Environmental Impact Factors

UNIT III: EIA PROCESS

- Measurement of environmental impact, organization, scope of pertinent environment factors
- Six generic steps, descriptive checklists, simple interaction matrix, stepped matrix, uniqueness ratio, habitat evaluation system
- Public involvement techniques, comprehensive environmental impact study

UNIT IV: INDIAN SCENARIO

EIA regulations in India, Case study of a large project

UNIT V: ENVIRONMENTAL MANAGEMENT SYSTEMS & STANDARDISATION

- Principles, problems, strategies, Review of political, ecological & remedial actions
- Future Strategies, multidisciplinary environmental strategies
- Introduction to ISO and ISO 14000, EMAS regulations, system based approach

UNIT VI: CARBON TRADING

Energy foot printing, food foot printing and carbon foot printing, carbon credits, CDM

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Course Title: **Project Formulation & Appraisal**			Course Code: CEM201
Credit: 4	L	T	P
	3	**2**	**0**
Year: 1st			Semester: II

UNIT I: PROJECT FORMULATION

Project, Concepts, Capital investments, Generation and Screening of Project Ideas, Project identification, Preliminary Analysis, Market, Technical, Financial, Economic and Ecological, Pre-Feasibility Report and its Clearance, Project Estimates and Techno-Economic Feasibility Report, Detailed Project Report, Different Project Clearances required

UNIT II: PROJECT ESTIMATION

Importance of Estimation, Method of Cost Estimating, Parameter Cost Estimating, Cost Capacity Factor, Detailed Cost Estimation, Provision of Escalation, Inflation Provision and Operation of Contingency Provisions

UNIT III: PROJECT COSTING

Project Cash Flows, Time Value of Money, Cost of Capital

UNIT IV: PROJECT APPRAISAL

NPV, BCR, IRR, ARR, Urgency, Pay Back Period, Assessment of Various Methods, Indian Practice of Investment Appraisal, International Practice of Appraisal, Analysis of Risk, Different Methods, Selection of a Project and Risk Analysis in Practice

UNIT V: PRIVATE SECTOR PARTICIPATION

Private sector participation in Infrastructure Development Projects, BOT, BOLT, BOOT Technology Transfer and Foreign Collaboration, Scope of Technology Transfer.

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Course Title: **New Building Materials & Technology**	Course Code: CEM202
Credit: 3	L T P **2 2 0**
Year: 1st	Semester: II

UNIT I: SPECIAL CONCRETE

Concretes, Behaviour of concretes, Properties and Advantages of High Strength and High Performance Concrete, Properties and Applications of Fibre Reinforced Concrete, Self-compacting concrete, Alternate Materials to concrete on high performance & high Strength concrete.

UNIT II: COMPOSITES

Types of Plastics, Properties & Manufacturing process, Advantages of Reinforced polymers, Types of FRP, Applications of FRP.

UNIT IV: NANO TECHNOLOGY IN BUILDING MATERIALS

Types & Differences between Smart and Intelligent Materials, application of nanotechnology in developing of smart building materials.

UNIT V: MATERIALS MANAGEMENT

Necessity and Importance, Objective and Functions of Materials Management, Organization for Materials Management

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Course Title: **Resource Management in Construction**			Course Code: CEM203
Credit: 3	L	T	P
	2	**1**	**1**
Year: 1st			Semester: II

UNIT I: RESOURCE PLANNING

Resource Planning, Procurement, Identification, Personnel, Planning for material, Labour, time schedule and cost control, Types of resources, manpower, Equipment, Material, Money, Time

UNIT II: LABOUR MANAGEMENT

Systems approach, Characteristics of resources, Utilization, measurement of actual resources required, Tools for measurement of resources, Labour, Classes of Labour, Cost of Labour, Labour schedule, optimum use Labour

UNIT III: MATERIALS & EQUIPMENT

Material: Time of purchase, quantity of material, sources, Transportation, Delivery and Distribution. Equipment: Planning and selecting by optimistic choice with respect to cost, Time, Source and handling.

UNIT IV: TIME MANAGEMENT

Personnel time, Management and planning, managing time on the project, forecasting the future, Critical path measuring the changes and their effects, Cash flow and cost control

UNIT V: RESOURCE ALLOCATION & LEVELLING

Time-cost trade off, Computer application – Resource levelling, resource list, resource allocation, Resource loading, Cumulative cost – Value Management

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Course Title: **Building Contract Administration**	Course Code: CEM204
Credit: 3	L T P **2 2 0**
Year: 1st	Semester: II

UNIT I: CONSTRUCTION CONTRACTS

Indian Contracts Act, Elements of Contracts, Types of Contracts, Features, Suitability, Design of Contract Documents, International Contract Document, Standard Contract Document, Law of Torts

UNIT II: TENDERS

Prequalification, Bidding, Accepting, Evaluation of Tender from Technical, Contractual and Commercial Points of View, Contract Formation and Interpretation, Potential Contractual Problems, World Bank Procedures and Guidelines

UNIT III: ARBITRATION

Comparison of Actions and Laws, Agreements, Subject Matter, Violations, Appointment of Arbitrators, Conditions of Arbitration, Powers and Duties of Arbitrator, Rules of Evidence, Enforcement of Award, Costs

UNIT IV: LEGAL REQUIREMENTS

Insurance and Bonding, Laws Governing Sale, Purchase and Use of Urban and Rural Land, Land Revenue Codes, Tax Laws, Income Tax, Sales Tax, Excise and Custom Duties and their Influence on Construction Costs, Legal Requirements for Planning Property Law, Agency Law, Local Government Laws for Approval, Statutory Regulations

UNIT V: LABOUR REGULATIONS

Social Security, Welfare Legislation, Laws relating to Wages, Bonus and Industrial Disputes, Labour Administration, Insurance and Safety Regulations, Workmen's Compensation Act, Indian Factory Act, Child Labour Act, Other Labour Laws

Faculty of Architecture
Curriculum Structure for M.Tech. in
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Course Title: **Computer Applications & Technology**			Course Code: CEM205
Credit: 4	L	T	P
	2	**0**	**4**
Year: 1st			Semester: II

UNIT I: INTRODUCTION

Overview of IT Applications in Construction, Construction process, Computerization in Construction, Computer aided Cost Estimation

UNIT II: USING SOFTWARES IN PROJECT MANAGEMENT

Hands on training on MS Project and Primavera to be provided for the preparation of scheduling of a small construction project

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Course Title: **Project Finance Management**			Course Code: CEM301
Credit: 4	L	T	P
	4	**0**	**0**
Year: 2nd			Semester: III

Objectives:

- *To equip students with the knowledge and tools of finance managements.*
- *To understand different types of funding, capital and funding institutions.*
- *Sensitizing towards financial investments and risks*
- *Understand the inter relation between time-cost -quality*

Learning Outcomes

This course would provide the students with an insight into the process of project finance management. It would sensitize the prospective project managers to the field of funding, financing and public private partnerships.

Unit I –

Identification, objectives of finance managements, Functions of finance manager, Iron triangle, Cash inflows, Cash outflows,

Unit II –

Finance needs, Source of finance – long term, short term.

Unit III –

Optimum capital structure, , Measurement of cost of capital, Cost of – debentures, Shares, Cost of reserves.

Unit IV –

Features of capital budgeting, Profitability, Rate of return, Amortization table, Value of money, EMI's, operational financing.

Unit V –

Public private partnership, PPP models, PPP breakeven,

.

Reference Book:

1. PMBOK - A Guide To The Project Management Body Of Knowledge.

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Course Title: **Project Risk Management**	Course Code: CEM302		
Credit: 3	L	T	P
	3	**0**	**0**
Year: 2nd	Semester: III		

Objectives:

- *To acquaint the students with the risks associated with the construction projects.*
- *To help students understand the various tools and techniques of risk managements*

Learning Outcomes

Each student shall be able to

- *Apply the knowledge, skills, and techniques of the discipline*
- *Understand the nature, scale and impact of various risks.*
- *Apply an analytical and logical sequence in thinking risk managements.*

Unit I - Risk in Infrastructure Projects
Identification of Risks, Specific categories of risk, concept of risk management, Leader's, Developer's and Government's perspective of risk.

Unit II – Risk management
Risk management process, Risk management responsibility, Stages of risk management, Risk response.

Unit III – Risk management process
Introduction, Risk identification, Brainstorming, Qualitative assessment, Mitigation, Risk analysis.

Unit IV – Tools and techniques of risk management
Introduction, Risk register, Risk estimate, MERA, Decision tree, Sensitivity analysis, Influence diagrams, Probability analysis, and Computer software.

Unit V – Risk management – Technical procedure
Introduction, Phases of construction, Post construction risks, Risk matrix, Exhibits.

Unit VI – Project Insurance
Insurance policy structure, types of insurance, guidance on insurance for construction projects, current condition of contracts, General services provided by the project insurance companies.

Reference Book:

1. PMBOK - A Guide To The Project Management Body Of Knowledge.
2. Project Risk Management: Processes, Techniques and Insights - by Chris Chapman and Stephen. Ward.

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Course Title: **Smart Buildings & Associated Technologies**			Course Code: CEM303
Credit: 3	L	T	P
	3	**0**	**0**
Year: 2nd			Semester: III

Objectives:

- *To acquaint with the characteristics of an intelligent building and smart building materials available in the market.*
- *To understand the building systems used in intelligent buildings*

Learning Outcomes

- *The student will be able to understand application of smart materials in buildings.*
- *The student will be sensitize towards the various responsive building systems.*

Unit I - Introduction
Meaning of the term "Smart", Smart buildings, Parameters of a smart building, Intelligent green building.

Unit II – Services In Smart Buildings
Lighting, HVAC, Plumbing, Fire Services, Security & Surveillance

Unit III – Building Automation Systems
Role of building automation in intelligent buildings, Types and uses of sensors in automation, Various protocols used in building automation, Stimulus Response System.

Unit IV – Smart Materials
Overview of smart building materials. Use of smart materials in intelligent buildings

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Course Title: **Building Energy Efficiency Codes & Rating Systems**	Course Code: CEM304		
Credit: 3	L	T	P
	3	**0**	**0**
Year: 2nd	Semester: III		

Objectives:

- *To understand the energy systems in built environment within the frame work of energy codes*

Learning Outcomes

- *The students will understand the implementation procedure of ECBC*
- *The student will be able to understand the process of energy rating of buildings in India.*

Unit I - Energy Systems & Buildings

Energy sources: conventional & renewable, Energy uses in buildings, overview of energy dependent building systems (HVAC, lighting systems etc.), Non mechanical buildings systems (building envelope, windows, glazing etc.), Use of BMS in energy audits and management.

Unit II – Energy Efficiency Codes For Buildings

Energy policies, laws, codes and standards for buildings including Energy Conservation Building Code of India and International Energy Code for buildings

Unit III – Energy Efficiency Ratings

Introduction to rating systems for building energy efficiency. Various rating system in India: LEED, GRIHA and process of getting certification for buildings. Overview of some international energy rating systems.

Unit IV – Carbon Foot Printing

Ecological Footprint studies: Ecosystem, Human Population and Resource use, Environmental Value System, Overview of GHG emissions.

Reference Book:

1. Energy Conservation Building Code

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Course Title: **Disaster Management**			Course Code: CEM305
Credit: 3	L	T	P
	3	**0**	**0**
Year: 2nd			Semester: III

Objectives:
The overall aim of this is to provide broad understanding about the basic concepts of Disaster Management To provide basic conceptual understanding of disasters and its relationships with development.

Learning Outcomes

- *To gain understand approaches of Disaster Risk Reduction (DRR) and the relationship between vulnerability, disasters, disaster prevention and risk reduction.*
- *To understand Medical and Psycho-Social Response to Disasters.*
- *To prevent and control Public Health consequences of Disasters*
- *To enhance awareness of Disaster Risk Management institutional processes in India*
- *To build skills to respond to disasters.*

Unit I –
Concepts of Hazard, Vulnerability, Risks, Natural Disasters (earthquake, Cyclone, Floods, Volcanoes), and Man Made Disaster (Armed conflicts and civil strip, Technological disasters, Human Settlement, Slow Disasters (famine, draught, epidemics) and Rapid Onset Disasters(Air Crash, tidal waves, Tsunami) Risks, Difference between Accidents and Disasters, Simple and Complex Disasters, Refugee problems, Political, Social, Economic impacts of Disasters, Gender and Social issues during disasters, principles of psychosocial issues and recovery during emergency situations, Equity issues in disasters, Relationship between Disasters and Development and vulnerabilities, different stake holders in Disaster Relief. Refugee operations during disasters, Human Resettlement and Rehabilitation issues during and after disasters, Inter-sectoral coordination during disasters, Models in Disasters.

Unit II –
Disaster Risk Reduction Strategies, Disaster Cycle, Phases of Disaster, Preparedness Plans, Action Plans and Procedures, Early warning Systems Models in disaster preparedness, Components of Disaster Relief-(Water, food, sanitation, shelter, Health and Waste Management), Community based DRR, Structural nonstructural measures in DRR, Factors affecting Vulnerabilities, , Mainstreaming disaster risk reduction in development, Undertaking risk and vulnerability assessments, Policies for Disaster Preparedness Programs, Preparedness Planning, Roles and Responsibilities, Public Awareness and Warnings, Conducting a participatory capacity and vulnerability analysis, , Sustainable Management, Survey of Activities Before Disasters Strike, Survey of Activities During Disasters, DRR Master Planning for the Future, Capacity Building, Sphere Standards. Rehabilitation measures and long term reconstruction. Psychosocial care provision during the different phases of disaster.

Unit III –
Introduction to disaster medicine, Various definitions in disaster medicine, Disaster life cycle, Disaster planning, Disaster preparation, Disaster recovery in relation to disaster medical management, Medical surge, Surge capacity, Medical triage, 275 National Assessing the nature of hazardous material - Types of injuries caused, Self-protection contaminated area and decontaminated area – Pre hospital medical management of victims – Triaging medical & psychosocial identification of hospitals and other medical facilities to offer efficient disastrous medical service – Safe patient transportation –Identification of valuable groups (Pregnancy, pediatric and geriatric other people with associated medical co morbidities)

(DM, Systemic Hypertension / Cardiac, Pulmonary, Cerebral and Renal) – knowledge about antidotes, - and Body decontaminations procedures (skin, GI tract, Respiratory tract and from blood) – Poly trauma Care - Specific treatment in emergency and Intensive Care Units – allocation of specialists in Local EMS System including equipments, safe use of equipments.

Unit IV –

Principles of Disaster Epidemiology, Rapid Health Assessment, Rapid Health needs assessment. Outbreak Investigation Environment health hygiene and sanitation issues during disasters, Preventive and prophylactic measures including Measles immunization, ORS, water, supply, chemoprophylaxis, food fortification, food supplements, MISP-Reproductive Health Care, International cooperation in funding on public health during disaster, To identify existing and potential public health problems before, during and after disasters. (168 countries Framework Disaster Risk Reduction), International Health Regulation, United Nation International Strategy for Disaster Risk Reduction (UNISDR), United Nation Disaster Management Team, International Search and Rescue Advisory Group, (INSARAG, Global Facility for Disaster Risk Reduction (GFDRR), Asean Region Forum (ARF), Asian disaster Reduction Centre (ADRC), SAARC 277 Disasters Management Centre (SDMC), USAID), UNDAC,UNOCHA, USAR.

Reference Book:

- Disaster Management Guidelines. GOI-UNDP Disaster Risk Reduction Programme (2009-2012).
- Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
- Guerisse P. 2005 Basic Principles of Disaster Medical Management. Act Anaesth. Belg;56:395-401
- Aim and Scope of Disaster Management. Study Guide prepared by Sharman and Hansen. UW-DMC, University of Washington.

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Course Title: **Thesis Project**	Course Code: CEM401		
Credit: 16	L	T	P
	16	**0**	**0**
Year: 2nd	Semester: IV		

Objectives:

- *To understand the flow of information, phases of planning, monitoring and execution in detail by application on a single project.*

Learning Outcomes

- *The students will understand the importance and application of planning process*
- *The student will be able to understand the monitoring and control processes.*
- *The student will be able to understand the challenges which are faced in real life situations on a construction project.*

Unit I - SELECTION, APPRAISAL AND FAMILIARISATION
Selection of a real world project to understand the application of project management. Collecting all data related to the project. Processing the data into useful information and analysing to understand the scope of the project.

Unit II – PLANNING, MONITORING AND CONTROLLING
Formulating a time schedule by proper resource allocation and establishing monetary constraints. Assessing the projects real world situation with the simulated plan of activities. Researching corrective methods for deviations and their application.

Unit III – FINANCE AND QUALITY CONTROL
Establishing benchmarks for quality. Applying the learnings of finance management. Simulating scope of funding and financing.

Unit IV – BUILDING MANUAL
Drafting a manual for the proper safety at site during construction. Preparing specifications and checklists for quality execution. Drafting a building manual for smooth operation of the building after handing over.

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Course Title: **Project Quality & Safety (Elective)**			Course Code: CEM402
Credit: 2	L	T	P
	2	**0**	**0**
Year: 2nd			Semester: IV

Objectives:

- *To sensitize the students towards safety.*
- *To acquaint students with the best practices regarding quality.*

Learning Outcomes

- *The student will be able to understand the need of safety and methods of enforcing the same on a construction site.*
- *The student will be able to set benchmarks for quality on a construction site and control the same.*

Unit I - INTRODUCTION TO QUALITY
Understanding the concept of quality, Benchmarking and key performance indicators. Understanding the best practices on construction sites.

Unit II – QUALITY MANAGEMENT
Understanding quality assurance and quality control. Learning international best practices and certifications in the field of quality.

Unit III – SAFETY MANAGEMENT
Understanding the concept and importance of safety. Cost of safety. Assessment of risks and hazards. Planning for safety.

Unit IV – ENSURING SAFETY AT CONSTRUCTION SITES
Safety Planning, monitoring and formulation of safety instructions for a construction site. Site specific safety guidelines.

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Course Title: **PPP in Construction Sector (Elective)**	Course Code: CEM403
Credit: 2	L T P **2 0 0**
Year: 2nd	Semester: IV

Objectives:

- *To understand the advantages of PPP mode of development.*
- *To understand the challenges associated with the PPP mode.*

Learning Outcomes

- *The student will be able to appreciate the advantages of PPP mode of development.*
- *The student will be sensitize towards the various challenges faced in real time PPP projects.*

Unit I - INTRODUCTION
Understanding public-private partnerships as a win-win situation. Advantages of PPP mode of development.

Unit II – STATUTORY AND CONTRACTUAL OBLIGATIONS
Understanding the stakeholders. Understanding the process of execution a PPP contract and creation of juridical persons for execution of a PPP contract.

Unit III – FINANCES IN A PPP PROJECT
Understanding the bottom line. Appreciating the mutual advantages of public and private partners along with other stakeholders.

Unit IV – PPP, ITS DRAWBACKS AND END USERS
Assessing the end user. The benefits of PPP for the end user. Drawbacks of PPP mode of development.

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Course Title: **Real Estate Management (Elective)**			Course Code: CEM404
Credit: 2	L	T	P
	2	**0**	**0**
Year: 2nd			Semester: IV

Objectives:

Intent of the course is to impart detailed knowledge of all aspects related to management of Real Estate projects to train the students as Real Estate Project Managers. Students are expected to comprehend interests of various stakeholders and build understanding to discharge appropriate functions

Learning Outcomes

Students will be able to understand the characteristic of real estate market. Students will also be able to understand the process of demand and supply of the market through various concepts of real estate management

Unit I –

Classification of real estate activities and peculiarities; Role, scope, working characteristics and principal functions of real estate participants and stakeholders; Factors affecting real estate market; Role of Government in real estate market; Statutory provisions, laws, rules and regulations application, land use controls in property development, registration and licensing requirements; Appraisal of Real Estate development projects; Real Estate financing; REIT

Unit II –

Land as a factor of production, land rent, land use problems, location decisions
Introduction to building economics; The Economic context: Materials, Labour, Capital; Economic aspects of design decisions; The Initial Cost of Building Projects; Construction Cost; Financing Construction Projects.; The Future Performance of Buildings: Cost-In-Use; Life Cycle Cost; Benefits and Value of Buildings; Measures of Economic Performance; Techniques of Economic performance analysis for building project.

Unit III –

Functions of Real Estate development; Project formulation; Feasibility studies; Developing Costing and financing; Planning, scheduling and monitoring of real estate projects; Marketing/advertising; Risk management; Documentation in real estate processes;
Transaction management; Transfer of titles and title records; Real Estate appraisal and valuation;

Unit IV –

Types of agreements between the consultants and principal; Knowledge base for assessment and forecasting the Real Estate market; Real Estate investment, sources and related issues; Code of ethics for Real Estate participants; Environmental issues related to Real Estate transactions; Closing the Real Estate transactions

Reference Book:

- **Stapleton's Real Estate management Practice** by - Anthony Banfield
- **Principles of Real Estate Managements** by - Anthony Downs

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Course Title: **Energy Management & Audit (Elective)**			Course Code: CEM405
Credit: 2	L	T	P
	2	**0**	**0**
Year: 2nd			Semester: IV

Objectives:

The overall aim of this course is to provide a broad understanding of energy consumption and its effects

Learning Outcomes

- *To understand the requirement and importance of energy management*
- *To understand the detailing of building energy survey.*
- *To identify the opportunities for energy consumption reduction*

Unit I –

An overview of energy consumption and its effects. Current energy consumption scenario in India. Need to reduce emissions. Aims and main aspects of energy management of buildings. Benefits and methodology for conducting the Historical Energy audit. Objectives & benefits and conducting Diagnostic Energy Audit. Instrumentation.

Unit II –

Energy management matrix as a tool to diagnose the current state of energy management in any given organization. Management issues covered in the matrix – energy policy, organization, motivation, information systems, Marketing & investment. Determining the organizational profile. Monitoring & Targeting of energy use.

Unit III –

Identification of opportunities for reducing energy consumption – improvements to the building fabric & building services

Unit IV –

Details of building energy survey – building information, building physical data, building envelope construction details, mechanical systems, electrical systems & equipment, hot water systems, indoor environmental conditions for each space, control systems and operating schedules..

Reference Book:

- Moss J. Keith, "Energy Management and Operating Costs in Buildings", E & FN Spon, London, 1996.
- O'Callaghan, Paul, W – "Buildings for Energy Conservation", Pergamon Press, London, 1980
- Levermore Geoff, "Building Energy Management Systems", E&FN Spon, London, 2000.

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Course Title: **Smart Cities (Elective)**	Course Code: CEM406
Credit: 2	L T P **2 0 0**
Year: 2nd	Semester: IV

Objectives:

The overall aim of this course is to provide a an understanding of smart city and its basic concept

Learning Outcomes

- *To understand the concept of a smart city and its requirement at present time*
- *To understand the mandatory components of a smart city*
- *To understand the concept of smart community*

Unit I –

What is a smart city? What is a smart community? Being smart is not just about technology; a city and a smart community enables better service delivery and quality of life for all of its residents.

Unit II –

Concept of smart community. Role and responsibilities of a community living in a smart city. Smart transportation system in a city. Case study of a smart community.

Unit III –

Smart building and home devices. Smart health facilities. Smart security and safety arrangements in a city.

Unit IV –

Policy formulation for smart governance and smart city. Case study of smart city with reference to its policies.

Reference Book:

"Draft Concept Note on Smart City Scheme". Government of India - Ministry of Urban Development (http://indiansmartcities.in/downloads/CONCEPT_NOTE_- 3.12.2014__REVISED_AND_LATEST_.pdf)

DIT UNIVERSITY

Dehradun

COURSE STRUCTURE & SYLLABUS
FOR
M. TECH. IN COMPUTER SCIENCE & ENGG.
BATCH 2016-18

Department of Computer Science & Engineering
Course Structure & Syllabus for M.Tech Program in CSE
Batch: 2016-18

Year: 1st **Semester: I**

Course Code	Course Title	L	T	P	Credit
DCA210	Agile Programming	3	0	2	4
DCA230	Modeling and Simulation	3	0	2	4
DCA240	Cloud Technologies	3	0	2	4
DCA011	Data Structures and Algorithms	4	0	0	4
DCA040	Fuzzy Logic & Genetic Algorithms	4	0	0	4
		4	0	0	4
	Total				**20**

Year: 1st **Semester: II**

Course Code	Course Title	L	T	P	Credit
DCB230	Advanced DBMS	3	0	2	4
DCB240	Big Data Analytics	3	0	2	4
	Elective-I	4	0	0	4
DCB110	Dissertation phase-I	0	0	4	4
	Total				**16**

List of Electives for 2nd Semester

Elective – I	
DCB620	Digital Image Processing
DCB670	Cryptography
DCB6A0	Advanced Computer Networks
DCB690	Neural Networks & Neuro Fuzzy Systems

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Year: 2nd **Semester: III**

Course Code	Course Title	L	T	P	Credit
DCB640	Information & Coding Theory	4	0	0	4
	Elective -II	4	0	0	4
DCC130	Dissertation Phase–II	0	0	4	12
	Total				**20**

List of Electives for 3rd Semester

Elective – II	
DCC620	Mobile and Ad-Hoc Networks
DCC630	Advanced Data Warehousing and Mining
CS753	Distributed Systems

Year: 2nd **Semester: IV**

Course Code	Course Title	L	T	P	Credit
DCD 120	Dissertation Phase–III	0	0	32	16

Summary of Credits

Year	Semester	Credit	Year Credit
First Year	**I**	**20**	**36**
	II	**16**	
Second Year	**III**	**20**	**36**
	IV	**16**	
Total Credits			**72**

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Course Title: **Agile Programming**	Course Code: **DCA210**
Credit: 4	L: **3** T: **0** P: **2**
Year: **1st**	Semester: **I**

Unit I **(8 L)**

Fundamentals of Agile

Genesis of Agile, Introduction and background, Agile Manifesto and principles , Overview of Agile Methodologies –Scrum Methodology, Extreme programming, Feature Driven Development, Continuous Integration, Refactoring, Pair programming, Simple Design, User Stories, Agile Testing,Agile Tool.

Unit II **(8 L)**

Agile Project Management

Agile Scrum Methodology, Project phases, agile Estimation, Planning game, product game, product backlog, Sprint backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance test and Verifying stories, Agile project velocity, Burn down chart, Sprint planning and retrospective, Daily scrum, Scrum roles-product Owner, Scrum Master, Scrum Developer, Scrum case study, Tools for Agile Project Management.

Unit III **(9 L)**

Agile Software Design and Programming

Agile Design Principles with UML Examples, Single Responsibility Principle, Open Closed Principle, Liskov Substitution principle, Interface Segregation principles, Dependency Inversion Principle, Need and significance of Refactoring Techniques, Continuous Integration, Automated build tool, Version control, Test- Driven Development (TDD),xUnit framework and tools for TDD.

Unit IV **(8 L)**

Agile Testing

The Agile lifecycle and its impact on testing, Testing user stories-acceptance test and scenarios, Planning and managing Agile testing, Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools to support the Agile tester.

Unit V **(9 L)**

Agile in Market

Market scenario and adoption of Agile, Roles in an Agile project, Agile applicability, Agile Distributed teams, Business benefits, Challenges in Agile, Risk and Mitigation, Agile project on cloud, balancing agility with Discipline,Agile rapid development technologies.

Text Books:

1. Ken Schawber,mike Beedle, Agile Software Development with scrum, Pearson Published 21 Mar 2008
2. Robert C. Martin, Pattern, Agile Software Development Principle, Prentice Hall.

Reference Books:

1. Lisa Crispin, Janet Gregory, A practical Guide for Testers and Agile Teams, Agile Testing: Addison Wesley.
2. Alistair Cockburn, Agile Software Development: The Cooperative Game, Addison Wesley

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Course Title: **Modeling and Simulation**	Course Code: **DCA230**
Credit: 4	L: **3** T: **0** P: **2**
Year: **1st**	Semester: **I**

UNIT 1: **8L**

Modelling: Definition of SYSTEM, system concepts, types of system, continuous and discrete systems, modelling process, verification and validation. Simulation: Introduction, classification of simulation models, advantages and disadvantages of simulation.

UNIT 2: **8L**

Discrete system simulation: Monte Carlo method, Random Number Generation: Congruence generators, long period generators, uniformity and independence testing. Random Variate Generation: Location, scale and shape parameters, discrete and continuous probability distributions; Inverse transformation method.

UNIT 3: **8L**

Queuing Theory: Introduction, notation and assumption, Little's theorem, queuing model with poison input, exponential service and arbitrary service times, simulation of queuing system, simulation of single-server queue, Simulation of two server queuing system.

UNIT 4: **8L**

Inventory Control: Elements of Inventory Theory, more complex inventory models, finite and infinite delivery rate model with and without back ordering, simulation of inventory systems.

UNIT 5: **10L**

Evaluation of simulation: length of simulation runs, variance reduction techniques. Project Management: PERT/CPM techniques, simulation of PERT networks. Model as components of information systems, modelling for decision support. Virtual Reality: the ultimate interactive model.

Text Books:

1. Gorden G., System Simulation, Prentice-Hall.
2. Deo Narsing, System Simulation, McGraw Hill.

Reference Books:

1. Payne J.A., Introduction to Simulation, McGraw Hill.
2. Banks, J., Carson, L.S., Nelson, B.L. and Nicol, D.M., Discrete Event System Simulation 3rd Ed., Pearson Education.
3. A.M. and Kelton, W.D., Simulation, Modeling and Analysis, Law, 3rd Ed., Tata McGraw-Hill.

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Course Title: **Cloud Technologies**	Course Code: **DCA240**
Credit: 4	L: **3** T: **0** P: **2**
Year: **1st**	Semester: **I**

Unit I **(8 L)**

Fundamentals of Cloud Computing: What it is & what it is not?, The old IT infrastructure versus the cloud, www, Internet, Cloud and cloud computing, Motivation for Cloud Computing, A comparison of IT infrastructure options, Historical developments: Client-Server computing, Peer to Peer Computing, Distributed Computing, Cluster & Grid Computing, Principals of parallel and distributed computing- Eras of computing, parallel vs. Distributed computing, Elements of parallel of computing, Elements of Distributed of computing, Technologies of distributed computing: Service oriented computing and architecture.

Unit II **(9 L)**

Introduction to High performance computing, Technical foundations of Cloud Computing, Goals of Cloud Computing, Resource Sharing at various levels, Cloud Architecture, NIST USA Cloud Computing Model: Essential Characteristics, Delivery Models, IaaS, PaaS, Saas, Deployment Models, Public, private, Hybrid & Community, Pricing Model of Cloud Computing, Advantages & Disadvantages of Cloud Computing, Open challenges: Cloud definition, cloud interoperability and standards, scalability and fault tolerance, Security, trust and privacy, Organizational aspects.

Unit III **(8 L)**

Companies in Cloud Computing, Cloud computing Engines- GAE, EC2, Microsoft Azure, Virtualization: Characteristics of virtualized environment, taxonomy of virtualization techniques, Virtualization and cloud computing, pros and cons of virtualization, Technology examples, Flex Tenancy architecture, Pros & Cons of Cloud service development, Cloud application development, Cloud computing applications, Cloud Computing for everyone, Computing for Community & corporate.

Unit IV **(8 L)**

Security: Securing the cloud-The security boundary, Security service boundary, security mapping, Data security-Brokered cloud storage access, storage location and tenancy, encryption, Auditing and compliance, Establishing identity and presence, Network security, Host security, compromise response, High-throughput computing: Task programming.

Unit V **(9 L)**

Advanced topics in cloud computing: energy efficiency in clouds, market based management of clouds- market oriented cloud computing; A reference model of MOCC technologies and initiatives supporting MOCC, Federated clouds / InterClouds, Third party cloud services- Meta CDN; SpotCloud, Using the mobile cloud.

Text Book:

1. R. Buyya, C. Vecchiola, S. T. Selvi, Matering Cloud Computing, Ed. Third reprint 2013, Mc Graw Hill education (India) Pvt. Ltd.
2. B. Sosinsky, Cloud computing Bible, Ed. Reprint 2014, Willy India Pvt. Ltd.

Reference Book:

1. M. Miller, Cloud Computing, Ed. 9th 2014, Pearson education in South Asia.

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Course Title: **Fuzzy Logic & Genetic Algorithms**	Course Code: **DCA040**
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: **I**

UNIT 1 **(8L)**

Fuzzy Sets (Introduction)

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory, Basic operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

UNIT2 **(8L)**

Fuzzy Logic (Fuzzy Membership, Rules)

Membership functions, Propositional logic and predicate logic, Inference in fuzzy logic, Fuzzy if-then rules, Fuzzy mapping rules, Fuzzy implications, Min-Max Theorem, Resolution Rule under Fuzzy environment, Refutation method for theorem proving, Defuzzifications,

UNIT3 **(8L)**

Reasoning with uncertain and incomplete information: The statistical approach to uncertainty, Introduction, Uncertain & incomplete knowledge. Review of Probability theory

UNIT4 **(8L)**

Bayes Theorem, Bayesian Networks, Bayesian reasoning. Decision Making, Joint Probabilities, Relationships, Polytrees., Dempster-Shafer theory of evidence, Certainty Factor, Non-monotonic systems.

UNIT 5 **(8L)**

Theoretical Foundation of Genetic Algorithms

Introduction: Basic Operators: Reproduction, Crossover & Mutation. Fitness function. Search Space, Schemas & Two-Armed and k-armed problem, Exact mathematical models, Applications of Genetic Algorithms.

Text Book:

1. G.J.Klir , Yuan,"Fuzzy Sets and fuzzy logic, Theory and applications", Prentice Hall India, 1995.
2. David E. Goldberg, "Genetic algorithms in search, optimization & Machine Learning" Pearson Education, 2006
3. Stuart Russel, Peter Norvig, "Artificial Intelligence A Modern Approach" Pearson (3rd Ed.)

Reference Book:

1. John Yen, Reza Langari, "Fuzzy Logic Intelligence, Control and Information", Pearson Education, 2006.
2. Timothy J Ross, "Fuzzy Logic with Engineering Applications", 2nd Edition, John Wiley, 2004.
3. H. Zimmermann, "Fuzzy Set Theory and its applications", 2nd Edition, Allied Publishers, 1996.
4. Melanle Mitchell, "An introduction to genetic algorithms", Prentice Hall India, 2002.

Department of Computer Science & Engineering
Course Structure & Syllabus for M.Tech Program in CSE
Batch: 2016-18

Course Title: **Data Structures and Algorithms**	Course Code: **DCA011**
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: **I**

Unit I **(8 L)**

Introduction: Algorithms, The role of algorithms in computing, analysis of algorithms, Time and Space Complexity ; Relation; Asymptotic notation, Growth of Functions, asymptotic analysis of recurrence relations, Recursion Tree; Master's Theorem, Medians and Order Statistics; Max-Min.Divide and conquer paradigm: Analysis of Divide-and-Conquer Algorithm; Quick Sort, Merge sort Analysis; Best Case, Worst Case and Average Case Analysis.

Unit II **(8 L)**

Advanced Design and Analysis Techniques : Dynamic Programming : Longest Common subsequence, optimal binary search trees ;Greedy Algorithm :Activity Selection problem, Theoretical foundation of greedy algorithm, Task Scheduling problem, Comparison of dynamic programming and Greedy algorithm with Knapsack as case study ; Fractional Knapsack and 0/1 Knapsack ; Back Tracking: Queen Problem, BFS,DFS ; Amortized Analysis:

Unit III **(8 L)**

Advanced Data Structure: Red-Black Trees, B Trees, Binomial Heaps, Fibonacci Heaps, Data Stricture for Disjoint Sets, Number–Theoretic Algorithm.

Unit IV **(8 L)**

Approximation Algorithms- the vertex-cover problem, The set covering problem; Randomized Algorithms ; String Matching : Knuth - Morris-Pratt Algorithm ; Polynomial time, Polynomial time verification, NP-completeness and reducibility, NP-Completeness proofs.

Unit V **(8L)**

Introduction: Need for parallel computers, Models of computation, analyzing parallel algorithms, expressing parallel algorithms,
Dense Matrix algorithms: Matrix vector Multiplication, Matrix matrix multiplication Sorting: Hyper quick sort, Merge sort, Bitonic merge sort

Text Book:

1. T.H. Cormen,C. E. Leiserson,R.L. Rivest, C. Stein, Introduction to Algorithms, 2nd Edition, PHI.

2. Ellis Harwitz and SartazSahani, Fundamentals of Computer Algorithms, Galgotia. 3.Basse, "Computer Algorithms: Introduction to Design & Analysis", Addision Wesley

3. Basse, Computer Algorithms: Introduction to Design & Analysis, Addision Wesley.

Reference Book:

1. The Design & Analysis of Computer Algorithms, A.V. Aho, J. E. Hopcroft, J.D. Ulman, Addison Wesley.

2. V. Manber, Introduction to Algorithms – A Creative Approach, Addison Wesley.
3 . Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar "Introduction to Parallel Computing", Second Edition, Addison Wesley, 2003. ISBN: 0- 201-64865.
4 . F.T.Leighton, "Introduction to Parallel Algorithms and Architectures: Arrays, Trees, Hypercubes", MK Publishers, San Mateo California

Department of Computer Science & Engineering
Course Structure & Syllabus for M.Tech Program in CSE
Batch: 2016-18

Course Title: **Advanced DBMS**	Course Code: **DCB230**
Credit: 4	L: **3** T: **0** P: **2**
Year: **1st**	Semester: **II**

Unit I **(8 L)**

Entity –Relationship model – Relational Model – Relational constraints- Relational algebra ,Tuple and Domain Relational calculus, SQL, Algorithms-Dependencies, Normal forms, ER Diagram, mapping and PL/SQL (Cursor, Trigger, Function, Procedure, Exceptional Handling etc) in Oracle 11i.

Unit II **(9 L)**

Query processing and optimization-Transactions-Properties of Transactions-Concurrency Control, Recovery, Security and Authorization, Storage-Indexing and Hashing, B+ Trees, Trees-X Trees, Dynamic Hashing .

Unit III **(9 L)**

Distributed Databases-Principles –Design-Queries Translation of queries optimization Access Strategies, Management of Distributed Transactions actions-concurrency Control-Reliability .

Unit IV **(10 L)**

Object Oriented Concepts-Data Object Models-Object Based Databases –Object Oriented Databases-Object Oriented Databases Relational Databases-Object Definition Languages-Object Query Languages-SQL3-Concurreency in OODBs-Storage and Access Data Access .

Unit V **(8 L)**

Other Database Models-Multimedia Databases-Parallel Databases Data Mining - Data Warehousing –Spatial Databases Concepts –Temporal Databases Concepts-Active Databases.

Text Book:

1. Fred R. McFadden, Jeffery A. Hoffer, Mary B. ,Modern Database Management, Prescott, Fifth Edition , Edition Wesley, 2000 .

2. Elmasri, Navathe, ,Fundamentals Of Database Systems, Third Edition,Addison Wesley, 2000 .

3. Abraham Silberchartz, Henry F. Korth, S. Sudarshan, Database System Concepts ,Third Edition, McGraw-Hill, 1996 .

Reference Book:

1. Jefry D. Ullman , Jenifer Widom ,A First Course in Database Systems, Pearson Education Asia, 2001 .

2. Stefano Ceri, Giuseppe Pelagatti, Distributed Databases Principles & Systems, McGraw-Hill International Editions, 1985

3. Rajesh Narang, Object Oriented Interfaces & Databases, Prentice Hall Of India,

Department of Computer Science & Engineering
Course Structure & Syllabus for M.Tech Program in CSE
Batch: 2016-18

Course Title: **Big Data Analytics**			Course Code: **DCB240**
Credit: 4	L	T	P
	3	**0**	**2**
Year: **1st**			Semester: **II**

Unit 1 Introduction **(8 L)**

Examples, data science articulated, history and context, technology landscape.

Unit 2 Data Manipulation at Scale **(8 L)**

Databases and the relational algebra ,Parallel databases, parallel query processing, in-database analytics ,MapReduce, Hadoop, relationship to databases, algorithms, extensions, languages ,Key-value stores and NoSQL; tradeoffs of SQL and NoSQL

Unit 3 Analytics **(8 L)**

Topics in statistical modeling: basic concepts, experiment design, pitfalls, Topics in machine learning: supervised learning (rules, trees, forests, nearest neighbor, regression), optimization (gradient descent and variants), unsupervised learning.

Unit 4 Communicating Results **(7 L)**

Visualization, data products, visual data analytics, Provenance, privacy, ethics, governance.

Unit 5 Special Topics **(9 L)**

Graph Analytics: structure, traversals, analytics, PageRank, community detection, recursive queries semantic web.

Text Book:

1- Mayer-Schönberger, V., & Cukier, K. (2013). *Big Data: A Revolution That Will Transform How We Live, Work, and Think*. Boston: Houghton Miffin Harcourt.

Reference Book:

1- Frank J. Olhorst **Big Data Analytics: Turning Big Data into Big Money (Wiley and SAS Business Series)**

Department of Computer Science & Engineering
Course Structure & Syllabus for M.Tech Program in CSE
Batch: 2016-18

Course Title: **Digital Image Processing (Elective-1)**			Course Code: **DCB620**
Credit: 4	L	T	P
	4	**0**	**0**
Year: **1st**			Semester: **II**

Unit I **(8 L)**

Introduction and Fundamentals

Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Spatial Domain

Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions:Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

Unit II **(8 L)**

Image Enhancement in Frequency Domain

Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

Image Restoration

A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

Unit III **(8 L)**

Color Image Processing

Color Fundamentals, Color Models, Converting Colors to different models, Color Transformation, Smoothing and Sharpening, Color Segmentation.

Morphological Image Processing: Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

Unit IV **(8 L)**

Registration:

Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation: Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

Unit V **(8 L)**

Feature Extraction: Representation, Topological Attributes, Geometric Attributes Description, Boundary-based Description, Region-based Description and Relationship.

Object Recognition: Deterministic Methods, Clustering, Statistical Classification, Syntactic Recognition, Tree Search, Graph Matching

Text Book:

1. Rafael C. Gonzalvez and Richard E.Woods, Digital Image Processing 2nd Edition , Pearson Education.

Reference Book:

1. R.J. Schalkoff. ,Digital Image Processing and Computer Vision ,John Wiley and Sons, NY.

2. A.K. Jain. , Fundamentals of Digital Image Processing, ,Prentice Hall, Upper Saddle River, NJ.

Department of Computer Science & Engineering
Course Structure & Syllabus for M.Tech Program in CSE
Batch: 2016-18

Course Title: **Cryptography (Elective-1)**			Course Code: **DCB670**
Credit: 4	L	T	P
	4	**0**	**0**
Year: **1st**			Semester: **II**

UNIT I **(8 L)**

Introduction to Security in Networks, Characteristics of Networks, Intrusion, Kinds of security breaches, Plan of attack, Points of vulnerability, Methods of defense , Control measures , Effectiveness of controls .

UNIT II **(9 L)**

Basic encryption and decryption, Encryption techniques, Characteristics of good encryption Systems, Secret key cryptography, Data Encryption Standard, International Data Encryption Algorithm, Advanced Encryption Standard.

UNIT III **(8 L)**

Public Key encryptions, Introduction to number theory, RSA algorithm, Diffie-Hellman, Digital Signature standard, Elliptic Curve cryptography, Digital signatures and authentication Trusted intermediaries, Security handshake pitfalls, Hash and MAC algorithms, Security standards, Kerberos.X.509AuthenticationService

UNIT IV **(8 L)**

Secure sockets, IPsec overview, IP security architecture, IPsec-Internet Key Exchanging (IKE) , IKE phases ,encoding , Internet security ,Threats to privacy ,Packet sniffing, Spoofing , Web security requirements , Real Time communication security .

UNIT V **(7 L)**

Secret Sharing Schemes, The Shamir Threshold Scheme, Access Structure and General Secret key sharing, Information Rate and Construction of Efficient Schemes, Multicast Security and Copyright production-Multicast Security, Broadcast Encryption ,Multicast Rekeying, Copyright Protection ,Tracing Illegally Redistribution keys.

Text Book:

1. William Stallings, "Cryptography and Network Security: Principles and Standards", Prentice Hall India, 3rd Edition, 2003.

2. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security: Private Communication in a public world", Prentice Hall India, 2nd Edition, 2002.

Reference Book:

1. Charles P. Pleeger, "Security in Computing", Pearson Education Asia, 5th Edition, 2001.

2. William Stallings, "Network Security Essentials: Applications and standards", Person Education Asia, 2000.

Department of Computer Science & Engineering
Course Structure & Syllabus for M.Tech Program in CSE
Batch: 2016-18

Course Title: **Advanced Computer Networks**	Course Code: **DCB6A0**
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: **II**

Unit I **(8 L)**

Network Layer design Issues, IPv4, IPv6, Shortest Path Routing, Distance Vector Routing, Flooding, Hierarchical Routing, Broadcast Routing, Multicast Routing.

Unit II **(8 L)**

Wireless Networks, GSM Architecture, CDMA, Mobility in networks, Handoffs.Mobile IP- IP Packet Delivery, Agent Discovery, Registration, Tunneling and Encapsulation.

Unit III **(8 L)**

Mobile TCP- Traditional TCP (Congestion Control, Slow Start, Fast Retransmit/Fast Recovery), Indirect TCP, Snooping TCP, Mobile TCP, Selective Retransmission, Transaction Oriented TCP.

Unit IV **(8 L)**

Wireless LAN- Infrared Vs Radio Transmission, Infrastructure and Ad-hoc Network, IEEE 802.11-System Architecture, Protocol Architecture, Physical Layer, Bluetooth.

Unit V **(8 L)**

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management, SSL.

Text Book:

1. Jochen Schiller"Mobile "Communications".
2. Andrew S. Tanenbaum ,"Computer Networks," Pearson Education

Reference Book:

1. Forouzan, B.A., Data communication and Networking, McGraw Hill (2006) 4th ed.

Department of Computer Science & Engineering
Course Structure & Syllabus for M.Tech Program in CSE
Batch: 2016-18

Course Title: **Neural Networks & Neuro Fuzzy Systems (Elective-1)**			Course Code: **DCB690**
Credit: 4	L **4**	T **0**	P **0**
Year: **1st**			Semester: **II**

Unit I **(8 L)**

Introduction: Biological neural system, Artificial Intelligent Systems, Modeling human performance. Uncertain & incomplete knowledge, Expert Systems Vs Neural Networks.

Unit II **(8 L)**

Foundations for connectionist networks. Architecture, Activation functions, Characteristics of Neural Networks, McCulloch-Pitts Neurons, Liner Separability

Unit III **(8 L)**

Perceptron learning, Pattern Classification. Hebb Rule. Adaline. Madaline. Delta Rule.Back propagation learning, Competitive learning, Hebbian learning, BAMs.

Unit IV **(8 L)**

Supervised and Unsupervised learning. Reinforcement learning, Kohonen Self Organizing

Maps, Applications of SOMs ,Adaptive Resonance Theory, Neural Network Applications.

Unit V **(8 L)**

Neuro-Fuzzy Systems: Types of Fuzzy Neural Nets, Neural components in a Fuzzy System

Fuzzy-ANN Controller, Support Vector Machines, Applications of SVMs.

Text Book:

1. Simon Haykin, "Neural Networks: A Comprehensive Foundation" , Prentice Hall

2. Nils J. Nilsson, "Artificial Intelligence - A New Synthesis", Morgan Kaufmann Publishers.

3. Robert J. Scholkoof "Artificial Neural Networks"; McGraw Hill Education, 2011

Reference Book:

1. "Fuzzy Logic with Engineering Applications" ,Timothy J. Ross, Wiley India.

2. "Artificial Intelligence A Modern Approach" ,Stuart Russel, Peter Norvig, Pearson (3rd Ed.)

Department of Computer Science & Engineering
Course Structure & Syllabus for M.Tech Program in CSE
Batch: 2016-18

Course Title: **Information & Coding Theory**			Course Code: **DCC610**
Credit: 4	L	T	P
	4	**0**	**0**
Year: **1st**			Semester: **III**

Unit I INFORMATION THEORY **(8 L)**

Information-Entropy, Information rate, classification of codes, Kraft McMillan inequality, Source coding theorem, Shannon-Fano coding, Huffman coding, Extended Huffman coding - Joint and conditional entropies, Mutual information - Discrete memory less channels – BSC,BEC – Channel capacity, Shannon limit.

Unit II SOURCE CODING: TEXT, AUDIO AND SPEECH **(8 L)**

Text: Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm Audio: Perceptual coding, Masking techniques, Psychoacoustic model, MEG Audio layers I,II,III, Dolby AC3 Speech: Channel Vocoder, Linear Predictive Coding

Unit III SOURCE CODING: IMAGE AND VIDEO **(8 L)**

Image and Video Formats – GIF, TIFF, SIF, CIF, QCIF Image compression: READ, JPEG.Video Compression: Principles-I,B,P frames, Motion estimation, Motion compensation,H.261, MPEG standard.

Unit IV ERROR CONTROL CODING: BLOCK CODES **(8 L)**

Definitions and Principles: Hamming weight, Hamming distance, Minimum distance decoding - Single parity codes, Hamming codes, Repetition codes - Linear block codes ,Cyclic codes - Syndrome calculation, Encoder and decoder - CRC

Unit V ERROR CONTROL CODING: CONVOLUTIONAL CODES **(8 L)**

Convolutional codes– code tree, trellis, state diagram - Encoding – Decoding: Sequential search and Viterbi algorithm – Principle of Turbo coding

Text Book:

1. R Bose, "Information Theory, Coding and Cryptography", TMH 2007
2. FredHalsall ,"Multimedia Communications: Applications, Networks, protocols and Standards", Pearson Education Asia, 2002 .

Reference Book:

1. ,Steven Roman ,Introduction to Coding and Information Theory.
2. T. M. Cover and J. A. Thomas, Elements of Information Theory, 2nd ed. Wiley interscience, 2006 .

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Department of Computer Science & Engineering
Course Structure & Syllabus for M.Tech Program in CSE
Batch: 2016-18

Course Title: **Distributed Systems (Elective-2)**	Course Code: **CS753**
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: **III**

Unit I **(8 L)**

Fundamentals of Distributed Computing: Architectural models for distributed computing systems, Issues and challenges in Distributed systems, Basic concepts in distributed computing such as clocks, message ordering, consistent global states.
Distributed Environments
Current systems and developments (DCE, CORBA, JAVA).

Unit II **(8 L)**

Coordination & Synchronization: Introduction, Distributed Mutual Exclusion, Elections, Multicast Communication, Atomic transactions, Deadlocks in Distributed systems.

Message Passing & Remote Procedure Calls : Features of a good message-passing system, RPC model. Implementing RPC mechanism, Stub Generation, RPC Messages, Marshaling Arguments and Results, Server Management, Communication protocols for RPCs.

Unit III **(8 L)**

Distributed File Systems: Features of Good DFS, File Models, File-Accessing models, File Service Architecture, File-sharing semantics, File Caching schemes, File replications.

Unit IV **(8 L)**

Distributed Shared Memory: Shared memory consistency models, Page based distributed shared memory, Shared variable distributed shared memory, Object based distributed shared memory.

Replication: Introduction, System Model & Group Communication, Fault Tolerant Services, Transactions with Replicated Data.

Unit V **(8 L)**

Advanced Topics in Distributed Computing: High Performance Computing-HPF, Distributed and mobile multimedia systems. Adaptability in Mobile Computing. Grid Computing and applications. Fault tolerant Computing Systems.

Text Book:

1. Tannenbaum, A, Van Steen ,Distributed Systems, Principles and Paradigm,. Prentice Hall India, 2002
2. Tannenbaum,Distributed Operating Systems, A. Pearson Education. 2006
3. Attiya, Welch, "Distributed Computing", Wiley India, 2006

Reference Book:

1. Singhal and Shivaratri, "Advanced Concepts in Operating Systems", McGraw Hill, 1994

Department of Computer Science & Engineering
Course Structure & Syllabus for M.Tech Program in CSE
Batch: 2016-18

Course Title: **Mobile and Ad-Hoc Networks (Elective-2)**	Course Code: **DCC620**
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: **III**

Unit I **(8 L)**

Issues in Mobile Computing, Wireless Telephony: Frequency Reuse, Cell Design, Cellular Architecture. Second Generation Cellular System- IS-95, GSM, IS-41, Data Operations- CDPD, HCSD, & GPRS. Third Generation Cellular System- 3G Concept, 3G Spectrum Allocation, 3G Service Classes & Application, UMTS, Introduction to Future Trends- 4G and Beyond.

Unit II **(8 L)**

WLAN Overview, Infrared LAN, Spread-Spectrum LAN, Narrowband Microwave LAN, MAC issues, Wireless Multiple Access Protocols- MACA & MACAW, IEEE 802.11 variants, HIPERLAN, PAN Technologies- Bluetooth and HomeRF, Wireless Metropolitan Area Networks (Wireless Local Loop).

Unit III **(8 L)**

Wireless Internet: IP Limitations, Mobile IP & its working, Issues in Mobile IP. TCP over Wireless, Wireless Access Protocol (WAP): Architecture & Protocol Stack. Security in Wireless Systems- WEP and Virtual Private Networks, Mobile Agents Computing, Transaction Processing in Mobile Computing Environment

Unit IV **(8 L)**

Ad Hoc Networks: Ad Hoc Networks vs. Cellular Networks, Issues in Ad Hoc Wireless Networks, Routing Protocols for Ad Hoc Wireless Networks-Design Issues and Classification, Vehicular AdHoc Networks-Introduction and Routing in VANETs, Delay Tolerant Networks-Introduction and Routing in DTNs.

Unit V **(8 L)**

Wireless Sensor Networks: Overview, Application Areas, Sensor Nodes' Architecture, Data Aggregation, Routing, and Query Processing in WSN. Intermittently Connected Delay Tolerant WSN- Introduction, End-to-End Reliability, Routing, and Link Layer Protocols in ICDT-WSN.

Text Book:

1. Jochen H. Schiller, Mobile Communication, Addison-Wesley, Pearson Education
2. Sipra Das Bit, Biplab K. Sikdar, Mobile Computing, PHI Learning
3. Vijay Garg, Elsevier,Wireless Communication & Networking , Morgan Kaufmann Publisher

Reference Book:

1. Subir K Sarkar, T G Basavaraju, C Puttamadappa, Ad Hoc Mobile Wireless Networks, Auerbach Publication .
2. A. Ananda, Mun Choon Chan, Mobile, Wireless & Sensor Networks, Wei Tsang Ooi , IEEE press, Willy Inter sciences.

Department of Computer Science & Engineering
Course Structure & Syllabus for M.Tech Program in CSE
Batch: 2016-18

Course Title: **Advanced Data Warehousing and Mining (Elective-2)**		Course Code: **DCC630**
Credit: 4	L **4**	T **0**	P **0**
Year: **1st**		Semester: **III**

Unit I **(8 L)**

Evolution of Database System Technology, Architecture of Data Mining System, Data Warehouse, Advanced Data and Information Systems and Advanced Applications, Data Mining Functionalities, Data Mining Task Primitives

Unit II **(8 L)**

Data Preprocessing, Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation

Unit III **(8 L)**

Data Warehouse Architecture, Data Warehouse Schemas, Multidimensional Data Model, OLTP, OLAP, OLAP operations, ROLAP, MOLAP, HOLAP

Unit IV **(8 L)**

Market Basket Analysis, Apriori Algorithm, Mining Multilevel Association Rules, Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back propagation

Unit V **(8 L)**

Cluster Analysis, Types of Data in Cluster Analysis, Partitioning Methods, K-Means Method, K-Medoids Method, DBSCAN, OPTICS. Mining Sequence pattern in Biological Data, Mining Multidimensional, Multilevel Sequential Pattern

Text Book:

1. Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques".,

Reference Book:

1. M.H.Dunham, "Data Mining: Introductory and Advanced Topics" , Pearson Education

2. Mallach ,Data Warehousing System McGraw –Hill

3. Alex Berson and Stephen J. Smith, "Data Warehousing, Data mining and OLAP", Tata McGraw-Hill, 2004.

DIT UNIVERSITY

Dehradun

COURSE STRUCTURE & SYLLABUS

OF

M.TECH. IN MECHANICAL ENGINEERING

BATCH 2016–18

Department of Mechanical Engineering
Course Structure & Syllabus for M.Tech in Mechanical Engineering
Batch: 2016-18

Year: 1st **Semester: I**

Course Code	Course Title	L	T	P	Credit
JBA010	Advanced Mathematics	4	0	0	4
LBA010	Advanced Thermodynamics	4	0	0	4
LBA020	Advanced Heat Transfer	4	0	0	4
LBA030	Advanced Fluid Mechanics	4	0	0	4
	Elective-1	4	0	0	4
	Total				**20**

Year: 1st **Semester: II**

Course Code	Course Title	L	T	P	Credit
LBB010	Experimental Methods	4	0	0	4
LBB120	Modeling and Simulation	3	0	2	4
	PG Elective-2	4	0	0	4
	PG Elective-3	4	0	0	4
LBB110	Dissertation phase-I	0	0	8	4
	Total				**20**

Year: 2nd **Semester: III**

Course Code	Course Title	L	T	P	Credit
	PG Elective-4	4	0	0	4
	PG Elective-5	4	0	0	4
LBC110	Seminar	0	0	8	4
LBC120	Dissertation phase-II	0	0	16	8
	Total				**20**

Year: 2nd **Semester: IV**

Course Code	Course Title	L	T	P	Credit
LBD110	Dissertation phase-III	0	0	32	16
	Total				**16**

List of Electives

LBA610	Energy Efficient Buildings
LBA620	Gas turbines and Compressors
LBA630	Design of Heat Exchangers
LBB610	Solar Energy systems
LBB620	Computational Methods for Heat Transfer and Fluid Flow
LBB630	Wind Energy Engineering
LBB640	Fuel and Combustion Technology
LBB650	I.C. Engines Combustion Process & Modeling
LBB660	Energy Management, Audit and Conservation
LBB670	Advanced Refrigeration and Air Conditioning
LBB680	Convective Heat and Mass Transfer
LBB690	Power Plant Design
LCA680	Advanced Mechanics of Solids
LBA6A0	Advanced Engineering Materials
LBA6B0	Finite Element Methods
LBA6C0	Optimal Design of Thermal Systems
LBA6D0	Tribological Practices
LBA6E0	Instrumentation and Measuring Systems
LCA6A0	Advanced Optimization Techniques

Summary of the Credits

Year	Semester	Credit	Year Credit
First Year	**I**	**20**	**40**
	II	**20**	
Second Year	**III**	**20**	**36**
	IV	**16**	
Total			**76**

Course Title: **Advanced Mathematics**	Course Code: **JBA010**
Credit: 4	L: **3** T: **1** P: **0**
Year: **1st**	Semester: **I**

UNIT-I

Numerical Techniques: Zeros of Transcendental and Polynomial equation using bisection method; Newton-Raphson method; Rate of convergence of above methods. Interpolation: Finite differences; difference tables; Newton's Forward and Newton's Backward Interpolation; Lagrange's and Newton divided difference formula for unequal intervals. Solution of system of Linear equations: Gauss-Seidal method; Crout method. Numerical Integration: Trapezoidal rule; Simpson's one-third rule; Simpson's three-eighth rule; Solution of ordinary differential (first order, second order and simultaneous) equations by Picard's and Fourth order Runga - Kutta methods.

UNIT-II

Partial Differential Equations (PDE)

Formation and Classification of PDE; Solution of One Dimension Wave Equation; and Heat Equation; Two Dimension Heat and Laplace Equation by Separation of variables Method.

UNIT-III

Integral Equations

Introduction, Conversion of a linear differential equation to an integral equation and vice versa; Solution of an integral equation; Integral equations with separable kernels; Solution of Fredhlom and Volterra equation by the method of successive approximations.

UNIT-IV

Special Functions

Series solution of ODE of 2^{nd}order with variable coefficient with special emphasis to Legendre and Bessel differential equation, Legendre polynomial of first kind, Bessel Function of first kind and their properties.

UNIT-V

System of Ordinary Differential Equations

Matrix Theory; Solution of linear system of differential equations by Matrix method; Eigen values and Eigenvectors; Unitary; Hermitian and Normal matrices.

Reference Books:

1. Applied Numerical Methods - Singeresu S. Rao.Pearson Education Inc., 2001.
2. Numerical methods for scientific and engineering computation -M.K. Jain, S.R.K. Iyengar and R.K. Jain New age international publication 5^{th} ed., 2007.
3. Numerical Analysis - Francis Scheid 2^{nd} ed., Schaum`s Series.
4. Advanced Mathematics for Engineers & Scientists by M.R.Spiegel. Schaum`s Series, Mcgraw Hill publishers, New Delhi, 2010.
5. Advanced Engineering Mathematics. 6thEd., C.R.Wylie and L.C.Barrett, McGraw Hill.
6. R. K. Jain & S. R. K. Iyenger Advanced Engineering Mathematics, 2^{nd} Edition, Narosa Publishing House, New Delhi, India, 2006.
7. S.S. Sastry, Introductory Methods of Numerical Analysis, 4^{th} edition, PHI learning Pvt. Ltd, 2005.
8. B. S. Grewal, Numerical Methods in Engineering and Science, (9^{th} Edition), Khanna Publishers, New Delhi, India, 2010.
9. B. S. Grewal, Higher Engineering Mathematics, 42th Edition, Khanna publication, New Delhi, India, 2012.

Department of Mechanical Engineering
Course Structure & Syllabus for M.Tech in Mechanical Engineering
Batch: 2016-18

Course Title: **Advanced Thermodynamics**	Course Code: **LBA010**
Credit: 4	L **4** T **0** P **0**
Year: **1st**	Semester: **I**

UNIT I:

Review of Basics: First law and Second law of thermodynamics, Unsteady flow processes- concept of entropy – principle of increase of entropy – entropy generation – Availability – concept of exergy, exergy balance and second law efficiency.

UNIT II

Thermodynamic Relations: Introduction to thermodynamic Property Relations; Partial Derivatives and Associated Relations, T-ds equations, Helmholtz and Gibb's function, Maxwell's relations, Clausius Claperyon Equation, Thermodynamic Relations Involving Enthalpy, Internal Energy, specific heats and Entropy, Joule Thomson effect; Joule-Thomson Coefficient, Changes in the enthalpy, internal energy, and entropy of real gases.

UNIT III

Non-Reactive Gas Mixtures : Introduction - basic definitions for gas mixtures – PVT relationship for mixtures of ideal gases - properties of mixtures of ideal gases – entropy change due to mixing - mixtures of perfect gases at different initial pressure and temperatures.

Reactive Gas Mixtures: Introduction- fuels and combustion, theoretical and actual combustion processes, enthalpy of formation and enthalpy of reaction, first and second law analysis of reacting systems.

UNIT IV

Thermodynamics of Compressible Flow: Introduction- Static and stagnation properties, speed of sound and mach number, 1 – D isentropic flow and property relations for isentropic flow for perfect gases.

Kinetic Theory of Gases – Molecular Model, Velocities Collisions, Pressure, Absolute Temperature, Clausius and Vander Walls Equations of state, Maxwell- Boltzmann Velocity Distribution, Average, Root Mean- Square and Most Probable Speeds, Speed Range, Energy Distribution Function, Equipartition of Energy, Specific heat of a Gas and mean free path, transport properties.

UNIT V

Thermodynamic cycles: Vapor power cycles- second law analysis of vapor power cycles, cogeneration, binary vapor cycles, combined gas vapor power cycles.

Gas power cycles:- ideal jet propulsion cycles- second law analysis of gas power cycles.

REFERENCE BOOKS

1. P.K. Nag, Engineering Thermodynamics - Tata McGraw-Hill Publications.
2. G. Van Wylen and R.E. Sonntag, Fundamentals of Classical Thermodynamics - Wiley, 1989.
3. YunusCengel& Boles, Thermodynamics (An Engineering Approach), TMH.
4. Michel A Saad, Thermodynamics for Engineers, Prentice- Hall of India Pvt. Ltd. 1972.
5. J.P. Holman., Thermodynamics, 4th Ed., McGraw Hill, 1988.
6. Francis W, sears and Gerhard L. Salinger, Thermodynamics Kinetic Theory and Statistical Thermodynamics; Addison Wesley Publishing Co. 3rd Ed. 1975.
7. Francis W, sears Addison, Thermodynamics Kinetic Theory and Statistical. Mechanics Wiley Publishing Co. 1953.
8. J. Hsieg, Principles of Thermodynamics, McGraw Hill, 1978.
9. K. Wark, Advanced Thermodynamics for Engineers, McGraw Hill, NY, 1987.

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Course Title: **Advanced Heat Transfer**	Course Code: **LBA020**
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: **I**

UNIT I

Heat Conduction: Fourier's law, thermal conductivity of matter, heat diffusion equation for isotropic and anisotropic media, boundary and initial conditions; One-dimensional steady-state conduction through plane wall, cylinder and sphere, conduction with thermal energy generation, heat transfer from extended surfaces, radial fins and fin optimization; Transient conduction – lumped capacitance method and its validity, plane wall and radial systems with convection, semi-infinite solid.

UNIT II

Heat Convection: Boundary layers concepts, laminar and turbulent flows, conservation equation, non-dimensional analysis, boundary layer equations, Reynolds analogy for turbulent flows; Forced convection inside tubes and ducts – correlations for laminar and turbulent forces convection; Forced convection over exterior surfaces – bluff bodies, packed beds, tube bundles in cross flow; Natural convection; Combined free and forced convection; Combined convection and radiation.

UNIT III

Heat Transfer with Phase Change: Nucleate, film and pool boiling, boiling in forced convection; Filmwise and dropwise condensation

UNIT IV

Thermal Radiation: Fundamental concepts, radiation intensity and its relation to emission, irradiation and radiosity, blackbody radiation, surface emission, surface absorption, reflection, and transmission, gray surface; Radiation exchange between surfaces, view factor, blackbody radiation exchange, radiation exchange between diffuse gray surfaces in an enclosure with absorbing and emitting media; Flame Radiation, solar Radiation.

UNIT V

Numerical Methods in Heat Transfer: Finite difference method for numerical simulation of steady state and transient heat transfer problems.

Reference Books:

1. J.P. Holman., 'Heat and Mass Transfer', Tata McGraw Hill, 8th Ed., 1989.
2. Heat Transfer – A Basic Approach - Ozisik M.N., McGraw-Hill Publications, 1985.
3. Principles of Heat Transfer - Frank Kreith& M. S. Bohn, Thomson Publications, 2001.
4. F.P. Incropera and D. P. Dewit, Fundamentals of Heat and Mass Transfer', 4th Ed. John Wiley & Sons (Asia) Pte Ltd, 2002.
5. E.R.D Eckert and R.M. Drake, Analysis of Heat and Mass Transfer, McGraw Hill, 1980.
6. Kays, W.M. and Crawford W., Convective Heat and Mass Transfer', McGraw Hill Inc., 1993.

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Course Title: **Advanced Fluid Mechanics**	Course Code: **LBA030**
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: **I**

UNIT I

Review of Basic Concepts: Concept of continuum, types of fluid, tensor analysis.

Basic Laws in Integral Form: Reynold's transport theorem, mass, momentum and energy equations in integral form and their applications.

UNIT II

Differential Fluid Flow Analysis: Continuity equation, Navier-Stokes equations and exact solutions, energy equation.

UNIT III

Ideal Fluid Flow Analysis: Two dimensional flow in rectangular and polar coordinates; Continuity equation and the stream function; Irrotationality and the velocity potential function; Vorticity and circulation; Plane potential flow and the complex potential function; Sources, sinks, doublets and vortices; Flow over bodies and d'Alembert's paradox; Aerofoil theory and its application.

UNIT IV

Low Reynolds Number Flow: Approximation of Navier-Stokes equation, approximate solutions of Navier-Stokes equation, Stokes and Oseen flows, hydrodynamic theory of lubrication.

Large Reynolds Number Flow: Prandtl's boundary layer equations, Blasius solutions, Falkner-Skan solutions, momentum integral equation, Halstein and Bohlen method, thermal boundary layers.

UNIT V

Compressible Fluid Flow: One dimensional isentropic flow, Fanno and Rayleigh flows, chocking phenomenon, normal and oblique shocks.

REFERENCE BOOKS

1. Advanced Fluid Mechanics - K. Muralidhar and G. Biswas, Narosa publications, 1996.
2. Introduction to Fluid Dynamics - Principles of Analysis & Design - Stanley Middleman, Wiley, 1997.
3. Currie, LG., Fundamental Mechanics of Fluids, 3rd ed., CRC Press, 2002.
4. White, P.M., Viscous Fluid Flow, 2nd ed., McGraw-Hill, 1991.
5. Ockendon, H. and Ockendon, J., Viscous Flow, Cambridge Uni. Press, 1995.

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Course Title: **Energy Efficient Buildings** ***(Elective)***	Course Code: **LBA610**
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: **I**

UNIT I

Architecture- Building Science and its significance. Indoor Environment. Components of Indoor Environment. Quality of Indoor Environment

UNIT II

Human Comfort-Thermal, Visual, Acoustical and Olfactory comfort. Concept of Sol-air temperature and its significance. Ventilation and is significance

UNIT III

Cooling and heating concepts, Passive concepts appropriate for the various climatic zones in India. Classification of building materials based on energy intensity.

UNIT IV

Energy Management of Buildings and Energy Audit of Buildings. - Energy management matrix monitoring and targeting.

UNIT V

Energy Efficient Landscape Design -Modification of microclimate through landscape elements for energy conservation.

REFERENCE BOOKS

1. Sodha M.,Bansal, N.K., Bansal,P.K., Kumar, A. and Malik, M.A.S., Solar Passive Buildings, Pergamon Press, 1986.
2. Koenigsberger, O.H., Ingersoll, T.G., Mayhew Alan and Szokolay, S.V., Manual of Tropical Housing and Building part 1: Climatic Design, OLBN 0 00212 0011,Orient Longman Limited, 1973.
3. Bureau of Indian Standards, I.S. 11907 –1986 Recommendations for calculation of Solar Radiation Buildings, 1986.
4. Givoni, B., Man, Climate and Architecture, Elsevier, Amsterdam, 1986.
5. Smith, R. J., Phillips, G.M. and Sweeney, M. Environmental Science, Longman Scientific and Technical, Essex, 1982.

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Course Title: **Gas Turbines and Compressors** ***(Elective)***	Course Code: **LBA620**
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: **I**

UNIT I

Gas Turbines: Introduction, Thermodynamics of Axial Flow Turbine, Degree of Reaction, Preliminary Design Procedure for Turbine Stage.

UNIT II

Determination of Turbine Stage Efficiency, Axial Flow Turbine Performance, Compressor, Turbine Matching, Radial Inflow Gas Turbine, Thermodynamic Processes in Radial Inflow Gas Turbine.

UNIT III

Centrifugal Fans Blowers and Compressors: Classification Performance Parameters and Characteristics, Change of Performance, Polytropic Efficiency, Preliminary Design of Centrifugal Compressors.

UNIT IV

Axial Flow Compressors: Introduction. Basic Theory, Preliminary Design of Compressor Stage, Determination of Stage Efficiency, Axial Flow Compressor Performance, Surge and Stall in Compressor and the Remedies.

UNIT V

Gas Turbine Power Plants: Fuel and fuel feed systems; combustion systems-design considerations and flame stabilization; regenerator types and design; gas turbine power; plant performance and matching; applications.

Reference Books:

1. Ganesan, V., "Gas Turbines", Tata McGraw Hill, Publishing Company Ltd, 4th Reprint, 2002.
2. Saravanamuttoo, HIH, Rogers, GFC, Cohen, H., "Gas Turbine Theory", Pearson Education Ltd, 5th Edition, 2001.
3. Yahya, S.M., "Turbines Compressors and Fans", Tata McGraw Hill, Publishing Company Ltd, Second Edition, 2002.

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Course Title: **Design of Heat Exchangers** ***(Elective)***	Course Code: **LBA630**
Credit: 4	L T P **4 0 0**
Year: **4th**	Semester: **VIII**

UNIT I
Classification of heat transfer equipment's, Specifications for heat exchangers, Standards of heat exchangers, design methodology, LMTD and NTU methods.

UNIT II
Design of double pipe heat exchanger-study and performance- Design of shell and tube heat exchanger.

UNIT III
Plate and spiral plate heat exchanger – plate heat exchanger for Dairy industry – Heat Pipes.

UNIT IV
Thermal design of heat exchange equipments such as Air pre-heaters, Economizer – Super heater and condensers.

UNIT V
Compact heat exchangers, Analysis and design of cooling towers.

Reference Books:

1. Kern, D. Q., "Process Heat Transfer," McGraw-Hill Book Co., N.Y. 1997.
2. Shah,R.K. and Sekulic,D.P., "Fundamentals of Heat Exchanger Design", John Wiley and Sons Inc., 2003.
3. Kokac, S., "Heat Exchangers-Thermal Hydraulic Fundamentals and Design", McGraw Hill.
4. Gupta, J. P. , `Heat Exchanger Design A Practical Look', Delhi: C. S. Enterprises, 1979.
5. Lienhard, J.H. and Lienhard, J.H., "A Heat Transfer Textbook", Phlogiston Press, Cambridge, Massachusetts, 2005.

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Course Title: **Experimental Methods**	Course Code: **LBB010**
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: **II**

UNIT I

Need and Objective of Experimental Study: Introduction, measurement Systems, Performance Terms

Wind Tunnels: Introduction, Classification, Low-speed Wind Tunnels, Power Losses in Wind Tunnel, Instrumentation and Calibration of Wind Tunnels, Wind Tunnel Balance

UNIT II

Flow Visualization: Introduction, Classification of Visualization Techniques, Interferometer, Schlieren and Shadowgraph.

Hot-Wire Anemometry: Introduction, Operating Principle, Hot-Wire Filaments, Constant Current Hot-Wire Anemometer (CCA), Constant Temperature Hot-Wire Anemometer, Hot- Wire Probes, Limitations of Hot-Wire Anemometer.

UNIT III

Analog Methods: Introduction, Hale-Shaw Apparatus, Electrolytic Tank, Hydraulic Analogy, Hydraulic Jumps.

Pressure Measurement Techniques: Introduction, Barometers, Manometers, Dial type pressure gauge, Pressure Transducers, Pitot, Static, and Pitot-Static Tube and Its characteristics, Flow direction measurement probes and Low Pressure Measurement Gauges.

UNIT IV

Velocity Measurement: Introduction, Velocity & Mach number from pressure measurements, Laser droplet anemometer- LDA Principle, Doppler shift equation, Reference beam system, Fringe system. Measurement of velocity by Hot-Wire Anemometer, Measurement of velocity using vortex shedding Technique, Fluid Jet Anemometer, Mass & volume flow measurement.

UNIT V

Temperature measurement: Introduction, Types of thermometers, Thermocouples, RTD, Thermisters, Pyrometers, Temperature measurement in fluid flows.

Uncertainty Analysis: Introduction, Estimation of measurement errors, External estimation of errors, Internal estimate of the error, Uncertainty Analysis- Uses of uncertainty analysis, Uncertainty estimation, General procedure- Uncertainty in flow Mach number, Uncertainty calculation.

REFERENCE BOOKS

1. Rathakrishnan, E., "Instrumentation, Measurements and Experiments in Fluids", CRC press, 2007.
2. Holman, J.P. &Gaida, W.J., "Experimental Methods for Engineers", Tata McGraw-Hill, 7th Edition, 2004.
3. Doebelin, E., "Measurement Systems", McGraw Hill Series in Mechanical Engineering, 5th Edition, 2003.
4. Beckwith, T.G. & Buck, N.L., "Mechanical Measurements", 5th Edition, Addison- Wesley Pub. Co., Second Edition, 1971.

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Course Title: **Modeling and Simulation**	Course Code: **LBB210**
Credit: 4	L T P **3 0 2**
Year: **1st**	Semester: **II**

UNIT I

Modeling of Thermal Systems: types of models, mathematical modeling, curve fitting, linear algebraic systems, numerical model for a system, system simulation, methods for numerical simulation. Acceptable Design of a Thermal System: initial design, design strategies, design of systems from different application areas, additional considerations for large practical systems.

UNIT II

Economic Considerations: calculation of interest, worth of money as a function of time, series of payments, raising capital, taxes, economic factor in design, application to thermal systems.

UNIT III

Problem Formulation for Optimization: optimization methods, optimization of thermal systems, practical aspects in optimal design, Lagrange multipliers, optimization of constrained and unconstrained problems, applicability to thermal systems.

Search methods: single-variable problem, multivariable constrained optimization, examples of thermal systems; geometric, linear, and dynamic programming and other methods for optimization, knowledge-based design and additional considerations, professional ethics.

UNIT IV

Optimization: Objective function formulation, Constraint equations, Mathematical formulation, Calculus method, Dynamic programming, Geometric programming, linear programming methods, solution procedures. Equation fitting, Empirical equation, best fit method, method of least squares.

UNIT V

Modeling of thermal equipments such as turbines, compressors, pumps, heat exchangers, evaporators and condensers.

REFERENCE BOOKS:

1. W.F. Stoecker, Design of Thermal Systems - McGraw-Hill.
2. Y. Jaluria, Design and Optimization of Thermal Systems –CRC Press.
3. Bejan, G. Tsatsaronis, M.J. Moran, Thermal Design and Optimization – Wiley.
4. R. F. Boehm, Developments in the Design of Thermal Systems – Cambridge University Press.
5. N.V. Suryanarayana, Design & Simulation of Thermal Systems – MGH.

Course Title: **Solar Energy Systems**	Course Code: **LBB610**
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: **II**

UNIT I

Introduction: Energy demand and supply, energy crisis, conventional and non-conventional energy resources, solar energy applications.

Solar Radiation: Sun, solar radiation, attenuation by atmosphere, solar radiation on earth, measurement, presentation and utilization of data.

UNIT II

Heat Transfer Concepts: Radiation characteristics of surface and bodies, absorbance, reflectance and transmittance, selective surface, sky radiation and wind convection.

Flat Plate Collectors: General description of flat plate collectors, general characteristics, performance, short term and long term performance, design.

UNIT III

Focusing Collectors: General description of focusing solar collectors, concentrators, receivers and orienting systems, general characteristics, performance, materials, design.

Energy Storage: Energy storage in solar process system, different types of storages, characteristics and capacity of storage medium, solar pond.

UNIT IV

Solar Heating and Cooling: Passive heating and cooling, nocturnal radiations, green house concept, ponds, active heating and cooling, solar water heaters, absorption cooling, combined solar heating and cooling systems, performance, economics of solar heating and cooling.

UNIT V

Solar Process Modeling: Solar process systems and components, component models, system models.

Solar Photovoltaics: Description and principle of working, performance characteristics, efficiency of solar cells, module design, PV systems, applications.

TEXT BOOKS

1. ArturV.Kilian., "Solar Collectors: Energy Conservation, Design and Applications", Nova Science Publishers Incorporated, 2009.
2. Soteris.A.Kalogiru., "Solar Energy Engineering: Processes and systems", 1st edition, Academic press, 2009.
3. K.Sukhatme, SuhasP.Sukhatme., "Solar energy: Principles of thermal collection and storage", Tata McGraw Hill, 8th edition, 2008.
4. Duffie, J. A. & W. A. Beckman., "Solar Engineering of Thermal Processes", 3rd edition, John Wiley & Sons, Inc., 2006.
5. H.P.Garg, J.Prakash., "Solar energy fundamentals and applications", Tata McGraw Hill, 2006.
6. D.YogiGoswami, Frank Kreith, Jan F.Kreider., "Principle of solar engineering", 2nd edition, Taylor and Francis, 2nd edition, 2003.
7. G.N.Tiwari., "Solar energy: Fundamentals, Design, Modeling and Applications", CRC Press Inc., 2002.

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Course Title: **Computational Methods For Heat Transfer & Fluid Flow** ***(Elective)***			Course Code: **LBB620**
Credit: 4	L	T	P
	4	**0**	**0**
Year: **1st**			Semester: **II**

UNIT I

Review of basic fluid mechanics and the governing (Navier-Stokes) equations. Types of partial differential equations- hyperbolic, parabolic and elliptic. Traditional solution methods- method of characteristics, separation of variables, Greens function method.

UNIT II

Preliminary computational techniques: Discretisation, converting derivatives to discrete algebric expressions, spatial derivatives, time derivatives. Approximation of derivatives, Taylor series expansion, general techniques. Accuracy of discretisation process-higher order vs lower order formulae.

UNIT III

Finite difference method: conceptual implementation, application to transient heat conduction problem. Convergence, consistency and stability of FD equation.

UNIT IV

Weighted residual methods: General formulation, Introduction to Finite Volume method, Equations with first derivatives and second derivatives. FV method applied to Laplace's equation.

UNIT V

Finite Element method: Linear interpolation, quadratic interpolation, two dimensional interpolations. Application to heat transfer problems.

REFERENCE BOOKS

1. Ferziger, J.H. and Peric, M.,"Computational Method for Fluif Dynamics", Springer-Verlag Berlin Heidelberg, 2002.
2. Anderson, J.D., "Computational Fluid Dynamics",McGraw-Hill Publication, 1995.
3. Murlidhar, K. and Sundararajan, T., "Computational Fluid Flow and Heat Transfer", Narosa Publications, 2nd Edition, Reprint 2014.

Course Title: **Wind Energy Engineering** ***(Elective)***	Course Code: **LBB630**
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: **II**

UNIT I

Wind Energy Fundamentals: Wind Energy Basics, Wind Speeds and scales, Terrain, Roughness, Wind Mechanics, Power Content, Class of wind turbines, Atmospheric Boundary Layers, Turbulence.

UNIT II

Wind Measurements, Analysis and Energy Estimates: Instrumentation for wind measurements, Wind data analysis, tabulation, Wind resource estimation, Betz's Limit, Turbulence Analysis, Aerodynamics Theory: Airfoil terminology, Blade element theory, Blade design, Rotor performance and dynamics, Balancing technique (Rotor & Blade), Types of loads; **Sources of loads.**

UNIT III

Wind Turbines Technology & Components: Wind turbines types:
Vertical Axis Type, Horizontal Axis, Constant Speed Constant Frequency, Variable speed Variable Frequency, Up Wind, Down Wind, Stall Control , Pitch Control, Gear Coupled Generator type, Direct Generator Drive ,PMG,Rotor Excited Sync Generator

UNIT IV

Wind Turbine Control & Monitoring System: Details of Pitch System & Control Algorithms, Protections used & Safety Consideration in Wind turbines, Wind Turbine Monitoring with Error codes, SCADA & Databases

UNIT V

Concept of Wind Farms and project cycle: Project planning, Site selection, Project execution, Operation and maintenance. Environmental concerns & Cost Economics

REFERENCE BOOKS

1. Wind energy Handbook, Edited by T. Burton, D. Sharpe, N. Jenkins and E. Bossanyi, John Wiley & Sons, 2001
2. Wind and Solar Power Systems, Mukund. R. Patel, 2nd Edition, Taylor & Francis, 2001.
3. L .L. Freris, Wind Energy Conversion Systems, Prentice Hall, 1990.
4. D. A. Spera, Wind Turbine Technology: Fundamental concepts of Wind Turbine Engineering, ASME Press.
5. Anna Mani & Nooley, "Wind Energy Data for India", 1983.

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Course Title: **Fuel and Combustion Technology** ***(Elective)***	Course Code: **LBB640**
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: **II**

UNIT I

Fuels & Fuel Analysis: Combustion Stoichiometry, theoretical & actual combustion processes, Air fuel ratio.

UNIT II

Combustion Thermodynamics calculation of heat of formation & heat of combustion – First law analysis of reacting systems.

UNIT III

Heat Treatment Furnaces: Industrial furnaces – process furnaces – Kilns – Batch & continuous furnaces.

UNIT IV

Flame, Flame Structure, Ignition and Igniters: flame propagation – deflagration – detonations-flame front – Ignition – self & forced ignition – Ignition temperature.

UNIT V

Combustion Appliances: Gas burners- Functional requirement of burners – Gas burner Classification –Stoker firing –pulverized system of firing.

REFERENCE BOOKS

1. Turns, S.R., An Introduction to Combustion: Concepts and Applications, 2nd ed., McGraw Hill, 2000.
2. Sharma, S.P. and Mohan, C., Fuels and Combustion, Tata McGraw-Hill, 1987.
3. Sarkar. S., Fuels and Combustion, Orient Longman, 2005.
4. Combustion Fundamentals, Roger Astrehlow, McGraw Hill
5. Combustion Engineering and Fuel Technology, Shaha A.K., Oxford and IBH.
6. Principles of Combustion ,KannethK.Kuo, Wiley and Sons.
7. An Introduction to Combustion , Stephen R. Turns, Mc. Graw Hill International Edition.
8. Combustion Engineering, Gary L.Berman & Kenneth W.Ragland, McGraw Hill International Edition.

Course Title: **Power Plant Design** ***(Elective)***	Course Code: **LBB690**
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: **II**

UNIT I

Introduction: Choice of power generation; Load & Load duration curves; Load factor; Diversity factor; Load deviation curve; Load management; Number and size of generating unit; Cost of electrical energy; Tariff-Power factor improvement.

UNIT II

Thermal Power Stations: Types of thermal power plants; elements of thermal power plant: Boiler, superheater, economizer, condenser, combustion chamber, gas loops and turbines etc., Site selection of Steam power plant, Principles of Electric Power station. General lay out. Instrumentation and control.

UNIT III

Gas Turbine Power plant: Types, Open and close cycle gas turbines; Components of the plant, Plant lay out, Combined cycle power plant.

UNIT IV

Hydropower Plant: Mass curve and storage capacity; Classification; Components; Turbines-Characteristics and their selection; Governor; Plant layout and design; Auxiliaries; Underground, automatic, remote controlled, and pumped storage plants.

UNIT V

Nuclear Power Plant: Basic principles, Elements of Nuclear power plant, Nuclear reactor and fuels, Hazards due to Nuclear power plants, Nuclear Instrumentation.

REFERENCE BOOKS

1. Nag. P.K, "Power Plant Engineering", 2nd edition, Tata McGraw Hill, 2002.ISBN-0-07-043599-5.
2. Dornkundwar, Arora, "Power Plant Engineering", Dhanpat Rai & Sons
3. Rajput. R.J. "A Text Book of Power Plant Engineering", Laxmi Publications, 2005 New Delhi.
4. Sharma.P.C., "Power Plant Engineering"; 9th edition; S.K. Kataria & Sons.
5. Ram K.S.; "Basic Nuclear Engineering"; Wiley Publication.

Course Title: **I.C. Engine Combustion Process & Modeling** ***(Elective)***			Course Code: **LBB650**
Credit: 4	L **4**	T **0**	P **0**
Year: **1st**			Semester: **I**

UNIT I
Combustion process in CI and SI engines, flame structure and speed, spray structure.

UNIT II
Engine combustion modeling-overview, Modeling of flame propagation and heat release, burning speed, flame propagation relation.

UNIT III
Knock fundamentals, auto ignition, knock models.

UNIT IV
Modeling spray, spray equation, droplet kinematics, fuel vaporization.

UNIT V
Modeling pollutant and soot formation in engines.

REFERENCE BOOKS

1. V.Ganesan, Computer Simulation of Spark Ignition Engine Processes, Universities Press, 1995.
2. Ashley S. Campbell, Thermodynamic Analysis of Combustion Engines, John Wiley and Sons, 1980.
3. V.Ganesan, Computer Simulation of Compression Ignition Engine Processes, Universities Press, 2002.
4. Gordon P. Blair, The Basic Design of two-Stroke engines, SAE Publications, 1990.
5. Horlock and Winterbone, The Thermodynamics and Gas Dynamics of Internal Combustion Engines, Vol. I & II, Clarendon Press, 1986.
6. J.I.Ramos, Internal Combustion Engine Modeling, Hemisphere Publishing Corporation, 1989.
7. J.N.Mattavi and C.A.Amann, Combustion Modeling in Reciprocating Engines, Plenum Press, 1980.

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Course Title: **Energy Management, Audit and Conservation** ***(Elective)***			Course Code: **LBB660**
Credit: 4	L **4**	T **0**	P **0**
Year: **1st**			Semester: **II**

UNIT I

Energy Scenario - Basics of Energy and its various forms , Energy Management and Audit , Material and Energy Balance , Energy Action Planning, Financial Management , Project Management , Energy Monitoring and Targeting , Global Environmental Concerns.

UNIT II

Energy Audit -various Energy Conservation Measures in Steam -Losses in Boiler. Energy Conservation in Steam Systems, Case studies.

UNIT III

Energy conservation- Centrifugal pumps, Fans & Blowers, Air compressor – energy consumption & energy saving potentials – Design consideration.

UNIT IV

Refrigeration & Air conditioning - Heat load estimation -Energy conservation in cooling towers & spray ponds – Case studies Electrical Energy -Energy Efficiency in Lighting – Case studies.

UNIT V

Organizational background desired for energy management motivation, detailed process of M&T-Thermostats, Boiler controls- proportional, differential and integral control, optimizers; compensators.

REFERENCE BOOKS:

1. Eastop T.D & Croft D.R, Energy Efficiency for Engineers and Technologists.
2. Logman Scientific & Technical, ISBN-0-582-03184, 1990.
3. Reay D.A, Industrial Energy Conservation, 1stedition, Pergamon Press, 1977.
4. Larry C Whitetal, Industrial Energy Management & Utilization.
5. Power System Engineering 2nd Ed. D P Kothari, I J Nagrath, Tata McGraw-Hill Co 2008.

Course Title: **Advanced Refrigeration and Air-conditioning** ***(Elective)***		Course Code: **LBB670**
Credit: 4	L **4**	T **0**	P **0**
Year: **1st**		Semester: **II**

UNIT I
Actual vapor compression system. Multipressure Systems , Cascade Systems-Analysis, Compressor-Types , performance , Characteristics of Reciprocating Compressors, Capacity Control , Types of Evaporators & Condensers and their functional aspects ,Expansion Devices and their Behavior with fluctuating load.

UNIT II
Vapor Absorption Systems-Aqua Ammonia &LiBr Systems, Steam Jet Refrigeration Thermo Electric Refrigeration, Air Refrigeration cycles.

UNIT III
Psychrometry: Moist Air properties , use of Psychrometric Chart , Various Psychrometric processes, Air Washer , Adiabatic Saturation. Summer and winter air conditioning: Air conditioning processes-RSHF , summer Air conditioning , Winter Air conditioning Bypass Factor. Applications with specified ventilation air quantity- Use of ERSHF, Application with low latent heat loads and high latent heat loads.

UNIT IV
Load estimation & air conditioning control: Solar radiation-heat gain through glasses, heat transfer through walls and roofs-Total cooling load estimation. Controls of temperature, humidity and air flow.

UNIT V
Air distribution: Flow through ducts , static & dynamic losses , air outlets , duct design–equal Friction method , duct balancing , indoor air quality , thermal insulation , fans & Duct system characteristics, fan arrangement variable air volume systems.

REFERENCE BOOKS
1. Arora C.P. , Refrigeration and Air Conditioning , Tata McGraw Hill, New Delhi, 2000.
2. Carrier Air Conditioning Co., Handbook of Air Conditioning Systems Design, McGraw Hill, 1985.
3. Langley, Billy C.; Refrigeration and Air Conditioning; 3rd Ed., Engie wood Cliffs (N.J) Prentice Hall 1986.
4. ASHRAE, Fundamentals and equipment, 4 volumes-ASHRAE Inc. 2005.
5. Jones, Air Conditioning Engineering, Edward Amold pub. 2001.
6. Stoecker W.F., Refrigeration and Air Conditioning, McGraw-Hill Book Company, 1989.
7. Jordan and Priester, Refrigeration and Air conditioning; 1985.
8. Goshnay W.B., Principles and Refrigeration, Cambridge University Press, 1985.

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Course Title: **Convective Heat and Mass Transfer** *(Elective)*			Course Code: **LBB680**
Credit: 4	L	T	P
	4	**0**	**0**
Year: **1st**			Semester: **II**

UNIT I

Introduction: Reynolds Transport Theorem; Compressible and Incompressible Flows; Conservation equations; Preliminaries on the Tensor Analysis; Dimensionless Numbers; Concepts of velocity boundary layer and thermal boundary layer, displacement thickness, momentum thickness and energy thickness; velocity boundary layer and thermal boundary layer equations.

UNIT II

External Laminar Flows: Laminar boundary layer flow over a Flat Plate; Similarity and integral solutions. Viscous dissipation effects on flow over a flat plate.

External Turbulent Flows: Analogy solutions for boundary layer flows – Integral equation solutions – Effects of dissipation on flow over a flat plate. Analysis of Heat Transfer and Flow over Circular Cylinders and spheres.

UNIT III

Internal Laminar Flows: Analysis of Heat transfer in laminar developed and developing duct flows. Turbulent Flow and Heat transfer through a pipe; Chilton-Colburn Analogy, Reynolds' Analogy; Convection Correlations.

UNIT IV

Natural Convection: Boussineq approximation – Governing equations – Similarity – Boundary layer equations for free convective laminar flows – Numerical solution of boundary layer equations. Free Convective flows through a vertical channel across a rectangular enclosure – Horizontal enclosure – Turbulent natural convection.

UNIT V

Condensation: Nusselts theory of film condensation on a vertical plate-assumptions and correlations of film condensation for different geometries.

Boiling: Nucleation and Bubble Growth; pool boiling; Flow boiling; Correlations.

Convective Mass Transfer: Concentration boundary layer – Momentum, mass and heat transfer analogy – Convective mass transfer numbers – Flow over flat plates, flow through tubes – Correlations – Evaporation of water into air – Heat and mass transfer in separated flows.

REFERENCE BOOKS

1. Patrick H. Oosthuigen & David Naylor, Introduction to Convective Heat Transfer Analysis, McGraw Hill, 1999.
2. W. M. Kays and E. M. Crawford, Convective Heat and Mass Transfer, McGraw Hill, 1993.
3. Louis C Burmeister, Convective Heat Transfer, John Wiley and Sons, 1993.
4. Adrian Bejan, Convective Heat Transfer, John Wiley and Sons, 1995.

Course Title: **Advanced Mechanics of Solids *(Elective)***	Course Code**: LCA680**
Credit: 4	L **4** T **0** P **0**
Year: **1st /2nd**	**Semester: II/III**

UNIT – I Shear Centre: Bending axis and shear center-shear center for axi-symmetric and unsymmetrical sections. Unsymmetrical bending, Bending stresses in Beams subjected to Nonsymmetrical bending; Deflection of straight beams due to nonsymmetrical bending.

UNIT – II Curved Beam Theory: Winkler Bach formula for circumferential stress – Limitations – Correction factors – Radial stress in curved beams – closed ring subjected to concentrated and uniform lads- stresses in chain links.

UNIT – III Torsion: Torsion of a cylindrical bar of Circular cross Section; Saint-Venant's semi-inverse methods; Linear elastic solution; Prandtl elastic membrane (Soap-Film) Analogy; Narrow rectangular cross Section; Hallow thin wall torsion members, Multiply connected Cross section, Thin wall torsion members with restrained ends Axi-Symmetric Problems: Rotating Discs – Flat discs, Discs of uniform thickness, Discs of Uniform Strength, Rotating Cylinders.

UNIT – IV Theory of Plates: Introduction; Stress resultants in a flat plate; Kinematics: Strain Displacement relations for plates; Equilibrium equations for small displacement theory of flat plates; Stress – Strain – Temperature relation for Isotropic plates: Strain energy of a plate, Boundary conditions for plate; Solution of rectangular plate problem; Solution of circular plate problem. Beams on Elastic Foundation: General theory; Infinite Beam subjected to Concentrated load; boundary conditions; Infinite beam subjected to a distributed lad segment; Semi-infinite beam with concentrated load near its end; Short Beams.

UNIT – V Contact Stresses: Introduction, problem of determining contact stresses; Assumptions on which a solution for contact stresses is based; Expressions for principal stresses; Methods of computing contact stresses; Deflection of bodies in point contact; Stresses for two bodies in contact over narrow rectangular area (Line contact), Loads normal to area; Stresses for two bodies in line contact. Normal and Tangent to contact area.

Books :

1. Advanced Mechanics of materials/Seely and Smith/ John Willey

2. Advanced Mechanics of materials / Boresi& Sidebottom/wiely international

3. Advanced strength of materials / Den Hortog J.P./Torrent

4. Theory of Plates /Timoshenko/

5. Strength of materials / Sadhu singh/ Khanna Publishers

6. Mechanics of Materials / Beer &Jhonson / McGraw Hill

7. Theory of Plates & Shells / Timoshenko/ McGraw Hill/ 2nd Edition

Course Title: **Advanced Optimization Techniques *(Elective)***	Course Code: **LCA6A0**
Credit: 4	L **4** T **0** P **0**
Year: **1st /2nd**	**Semester: II/III**

Linear Programming: Geometry of linear programming, Graphical method, Linear programming (LP) in standard form, Solution of LP by simplex and revised simplex methods, Exceptional cases in LP, Duality theory, Dual Simple method, Sensitivity analysis. **08)**

Network Analysis: Transportation problem (with transshipment), Assignment problem, Traveling-salesman problem, Shortest route problem, Minimal spanning tree, Maximum flow problem. **(08)**

Integer Programming: Branch and bound algorithm, Traveling salesman problem. (**06)**

Dynamic programming: Forward recursions, General problem, Reliability problem, Capital budgeting problem, Cargo-loading problem. **(06)**

CPM and PERT: Drawing of networks, Removal of redundancy, Network computations, Free slack, Total slack, Crashing, Resource allocation. **(08)**

Non-Linear Programming: Characteristics, Concepts of convexity, maxima and minima of functions of n-variables using Lagrange multipliers and Kuhn-Tuker conditions, One dimensional search methods, Fibonacci, golden section method and gradient methods for unconstrained problems. **(08)**

Text Books:

1. Taha, H.A., Operations Research: An Introduction, Prentice Hall of India (2007) 8th ed.
2. Kasana, H.S., Introductory Operation Research: Theory and Applications, Springer Verlag
3. Rardin, Ronald L., Optimization in Operations research, Pearson Education
4. Ravindran A, Phllips D.T. and Solberg J.J. Operation Research: Principles and Practice, John Wiley

Course Title: **ADVANCED ENGINEERING MATERIALS** *(Elective)*	Course Code: **LBA6A0**		
Credit: 4	L **4**	T **0**	P **0**
Year: **1st /2nd**			**Semester: II/III**

Unit I Ferrous Materials, their Properties and Applications: Plain carbon steels, their properties and application: plain carbon steels, effects of alloying elements in plain carbon steels. Alloy steels, tools steels, stainless steels, low and high temperature resisting steels, high strength steels, selections, specifications, form and availability of steel. Cast irons-white, grey, modular malleable and alloy cast irons.

Unit II Heat Treatment of Steels- TTT diagrams, annealing, normalizing, hardening and tempering of steel. Austempering and martempering of steel. Hardenibility, Quench test. Effect of grain on the properties of steel.
Surface hardening of steel: Carborising, nitriding, carbonitriding cyniding, flame and induction hardening. case depth and depth of hardening.

Unit III Nonferrous materials, their properties and application: brasses, bronzes, cupro-nickel alloys, aluminum, magnesium and titanium alloys, bearing materials.

Unit IV Composites Polymer: Polymer, metal-metal, ceramic –ceramic, ceramic-polymer, metal-ceramic, metal polymer composites. Dispersion reinforced, particle reinforced, laminated and fiber reinforced composites. Bio degradable composites; Green composite and properties and applications, High performance ceramics; properties and applications, Nano composites; properties and applications.

Unit V Elastomers& Others Types, properties and identifications of different types of rubbers vulcanization, fabrication and forming techniques of rubber. Introduction of plastics and ceramics – types, application, and process. Smart materials- introduction and types.

Text Books:

1. Smallman, R.E., and Bishop, R.J., Metals and Materials, Butterworth-Heinemann, Oxford University Press.
2. Raghvan, V., Materials Science & Engineering, PHI.
3. Callister, W.D., Materials Science & Engineering: An Introduction, Wiley & Sons.
4. Smith, W., Principles of Materials Science and Engineering. McGraw Hill.

Department of Mechanical Engineering
Course Structure & Syllabus for M.Tech in Mechanical Engineering
Batch: 2016-18

Course Title: **FINITE ELEMENT METHODS** ***(Elective)***	Course Code: **LBA6B0**
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st /2nd**	**Semester: II/III**

Unit I Introduction: Introduction to Finite Element Method. Difference between Finite Element and Finite Difference Methods. Method of Weighted Residuals: Collocation, Method of Least squares, Galerkin's method, Element of Calculus of Variations, Ritz Method, Equivalence of Ritz and Galerkin method for some cases.

Unit II Linear and Quadratic 1D Elements: Linear, quadratic and higher order elements. Application to solutions of ODE. Assembly and solution of banded system.

Unit III Finite Element to 2D Problems: Introduction, Difference between 1D and 2D approach, types of 2D elements, Local coordinates, Global coordinates. Triangular elements: linear and quadratic elements with area coordinates Rectangular elements: General Quadrilateral elements, serendipity elements, linear and higher order shape functions

Unit IV Solution of Some Fluid Flow and Heat Transfer Problems: Assembly of element equations, Solution of equations Application to flow and heat transfer problems, Discussion over higher order differential equations.

Unit V Some Programming Aspects: Some programming aspects: Mesh Generation, Mesh refinement, Numerical integration etc.

Text Books:

1. Reddy J.N., An Introduction to Finite Element Method, McGraw Hill Publication.
2. Segerlind L.S., Applied Finite Element Analysis, John Wiley & Sons.
3. Rao S.S., The Finite Element Method in Engineering, Pergamon.

Course Title: **OPTIMAL DESIGN OF THERMAL SYSTEMS** *(Elective)*			Course Code: **LBA6C0**
Credit: 4	L	T	P
	4	**0**	**0**
Year: **1st /2nd**			**Semester: II/III**

Unit I Basic considerations in Design: Engineering design, integrated approach, formulation of the design problem, steps in design process, conceptual and acceptable design.

Unit II Modeling of Thermal systems: features of modeling, types of models, Mathematical modeling and validation, Physical modeling, curve fitting, numerical modeling.

Unit III System simulation: Principles of numerical modeling and simulation, multivariable simulation methods with wide range of applications, economic considerations.

Unit IV Optimization: Basic concepts, optimization methods; Calculus and search methods; Linear, dynamic and Geometric programming; Multi-objective optimization, knowledge based design and additional considerations.

Unit V Application of softwares for design and optimization of thermal systems.

Text Books:

1. Design and Optimization of Thermal Systems by Yogesh Jaluria, CRC press.
2. Design of Thermal Systems by W.F. Stoecker, McGraw Hill.
3. Optimization theory and applications by S.S. Rao, Wiley Eastern.

Course Title: **TRIBOLOGICAL PRACTICES** ***(Elective)***	Course Code: **LBA6D0**		
Credit: 4	L	T	P
	4	**0**	**0**
Year: **1st /2nd**			**Semester: II/III**

Unit I Introduction: Tribological consideration, nature of surfaces and their contact. Introduction, physico-mechanical properties of surface layer; Geometrical properties of surfaces, method of studying surface; Contact of smooth surfaces, contact of rough surfaces. Role of friction, laws of static friction, causes of friction; Adhesion. Adhesion theory, laws of rolling friction, friction of metals and nonmetals, friction measurement; Wear definitions, types of wear, mechanism of wear, factors affecting wear behavior, measurement of wear a brief introduction of wear test equipments, wear in plastics.

Unit II Industrial Lubricants and Their Additives: Functions of lubricants, types of lubricants and their industrial uses; Solid lubricants and their functions, liquid mineral lubricants, synthetic liquid lubricants, greases, properties of liquid and grease lubricants, viscosity, Newtonian and Non-Newtonian lubricants, temperature and pressure dependence measurement, other properties of lubricants; Lubricant additives, general properties and selection for machines and processes; Oil reclamation and preventive maintenance for lubricants.

Unit III Fluid-Film Lubrication: Fluid mechanics concepts, equations of continuity and motion; Generalized Reynold's equation with incompressible and compressible lubricants; Hydrodynamic lubrication, Tower's experiment, finite bearings, partial journal bearings, solution of finite bearings using Galerkin, finite difference and FEM.

Unit IV Dynamically loaded journal bearings: Solution of the generalized Reynold's equation for infinite and short bearing, load carrying capacity, Sommerfield numbers, journal centre locus, whirling; Hydrostatic lubrication-- basic concepts, applications, compensated thrust and journal bearings and their solution using FEM, controlling flow with restrictors, design of restrictors for compensated bearings.

Unit V Gas Lubrication: Types of gas bearings and their characteristics; Reynolds equation for iso-thermal, polytropic and adiabatic supporting gas films; Introduction to porus bearing permeability, solution of thrust and journal bearings.

Text Books:

1. Conner, J.J. and Boyd, J., "Standard Handbook of Lubrication Engineering", McGraw Hill,1968.
2. Stachowiak, G. and A W Batchelor, A. W., "Engineering Tribology", 3rd Ed, Butterworth-Heinemann, 2005.
3. Khonsari, M. M. and Booser, E. R., "Applied Tribology: Bearing Design and Lubrication", 2nd Ed, Wiley, 2008.
4. Bhushan, B., "Principles and Applications of Tribology", Wiley, 1999.

Course Title: **INSTRUMENTATION AND MEASURING SYSTEMS** ***(Elective)***	Course Code: **LBA6E0**
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st /2nd**	**Semester: II/III**

Unit I Introduction: generalized configuration and functional stages of measuring systems. The transducer and its environment; an overview; sensing process and physical laws.
Types of measurement problems. Transducer classification and their modeling; information, energy and incremental models; characteristics of instruments, design and selection of components of a measuring system.

Unit II Dynamic Response of Instruments: Mathematical model of a measuring system, response of general form of instruments to various test inputs; time domain and frequency domain analysis. Elementary transfer functions and Bode plots of general transfer functions.

Unit III Errors in Measurement and Its Analysis: Causes and types of experimental errors; systematic and random errors. Uncertainty analysis; computation of overall uncertainty; estimation for design and selection for alternative test methods.

Unit IV Transducers: Developments in sensors, detectors and transducer technology; displacement transducers; force, torque and motion sensors; piezoelectric transducers; capacity type transducers; Strain gage transducers; accelerometers, pressure transducers based on elastic effect of volume and connecting tubing.

Unit V Data Acquisition and Signal Processing: Systems for data acquisition and processing; modules and computerized data system; digitization rate; time and frequency domain representation of signals, and Nyquist criterion. A brief description of elements of mechatronics; modular approach to mechatronics and engineering design.

Text Books:

1. Doeblin E. O., "Measurements System Application and Design", 5th Ed., McGraw Hill 2004
2. Trietly Harry L., Dekker Marcel, "Transducers in Mechanical and Electronic Design", 1st Ed., CRC Press 1986
3. Beckwith T. G., Marangoni R. D., and Lienhard J. H., "Mechanical Measurements", 6th Ed., Prentice Hall 2006

DIT UNIVERSITY
Dehradun

Course Structure and Detailed Syllabus

of

M.B.A.

Batch 2016-18

Department of MBA
Detailed Syllabus for MBA
Batch: 2016-18

Year: 1st **Semester: I**

Sr. No.	Course Code	Course Title	L	T	P	Credit
1	GAA010	Business Communication	3	0	0	3
2	GAA020	Business Economics	3	0	0	3
3	GAA030	Business Law	2	0	0	2
4	GAA040	Financial Accounting and Analysis	4	0	0	4
5	GAA050	Management Concepts	2	0	0	2
6	GAA060	Marketing Management	3	0	0	3
7	GAA070	Organizational Behavior	3	0	0	3
8	GAA080	Statistics for Business Decisions	4	0	0	4
		Total Credits				**24**

Year: 1st **Semester: II**

Sr. No.	Course Code	Course Title	L	T	P	Credit
1	GAB010	Business Research Methods	4	0	0	4
2	GAB020	Consumer Behavior	2	0	0	2
3	GAB030	Corporate Finance	3	0	0	3
4	GAB040	Global Business Environment	2	0	0	2
5	GAB050	Human Resource Management	3	0	0	3
6	GAB060	Managerial Decision Modeling	3	0	1	4
7	GAB070	Operation Management	3	0	0	3
8	GAB180	Business Simulation	1	0	2	2
9	GAB190	Comprehensive Viva-voce	0	0	2	1
		Total Credits				**24**

Department of MBA
Detailed Syllabus for MBA
Batch: 2016-18

Year: 2nd **Semester: III**

Sr. No.	Course Code	Course Title	L	T	P	Credit
1	GAC010	Business Ethics and Corporate Governance	2	0	0	2
2	Specialization-I	Elective 1	3	0	0	3
3		Elective 2	3	0	0	3
4		Elective 3	3	0	0	3
5	Specialization-II	Elective 1	3	0	0	3
6		Elective 2	3	0	0	3
7		Elective 3	3	0	0	3
8	GAC580	Summer Internship and Report	0	0	4	2
9	GAC190	Business Data Analysis	0	0	2	1
10	GAC4100	Industrial Visit	0	0	0	1
		Total Credits				**24**

Year: 2nd **Semester: IV**

Sr. No.	Course Code	Course Title	L	T	P	Credit
1	GAD010	Strategic Management	3	0	0	3
2	Specialization-I	Elective 4	3	0	0	3
3		Elective 5	3	0	0	3
4	Specialization-II	Elective 4	3	0	0	3
5		Elective 5	3	0	0	3
6	GAD170	Project and Viva-voce	0	0	8	4
7	GAD180	Comprehensive Viva-voce	0	0	8	1
		Total Credits				**20**

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List of Electives

Subject Code	Marketing (1)	Subject Code	Finance (2)
GAD610	B-2-B Marketing	GAC6410	Cost and Management Accounting
GAC620	Digital and Social Media Marketing	GAD6420	Financial Derivatives
GAD630	Integrated Marketing Communication	GAC6430	Financial Markets And Institutions
GAD640	Product and Brand Management	GAD6440	International Financial Management
GAC650	Retail Management	GAD6450	Risk Management and Insurance
GAC660	Sales and Distribution Management	GAC6460	Security Analysis and Portfolio Management
GAD670	Service Marketing	GAD6470	Tax Planning and Management
Subject Code	**Human Resource (3)**	**Subject Code**	**Business Analytics (4)**
GAC6210	Acquisition and Talent Management	GAC6610	Business Intelligence and Data Warehousing
GAD6220	Compensation Management	GAC6620	Data Analytics Fundamentals
GAD6230	Counseling Skills for Managers	GAD6630	Financial Analytics
GAC6240	Industrial Relation	GAD6640	Human Resource Analytics
GAD6250	Labour Laws	GAC6650	Marketing Analytics
GAD6260	Organizational Development and Change Management		
GAC6270	Organizational Structure and Change		
GAD6280	Performance Management		
GAD6290	Training and Development		

List of Audit Courses offered across Semester

Semester	Course
I	Soft Skills
II	Advanced Excel
III	Finishing School
IV	Data Analysis using R

Summary of Credit

Year	Semester	Credit		Year Credit
		Theory	Practical	
First Year	I	24	--	48
	II	21	3	
Second Year	III	21	4	45
	IV	15	5	
Total				93

Department of MBA
Detailed Syllabus for MBA
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Course Title: **Business Communication**	Course Code: **GAA010**
Credit: 3	L **3** T **0** P **0**
Year: **1st**	Semester: **I**

UNIT-1:

Understanding the Foundation of Business Communication: Attitudes toward Indian Business through the years, characteristics of effective business messages, basic forms of communication, theories of communication, recognize the changing environment, communication in organizational settings, communication barriers, guidelines for overcoming communication barriers, communication of ethics and cross-cultural messages, working in teams, group dynamics, characteristics of effective teams, conflicts in teams, writing collaborative messages, guidelines for critiquing the writing of others, making your team meetings more productive, improving listening skills, improving nonverbal communication.

UNIT-2:

Writing Business Messages and delivering oral presentations: Three-step writing process, planning business messages, analyzing your purpose and audience, selecting the appropriate channel and medium, organizing your message, composing and shaping your messages, writing effective E-Mail messages, writing persuasive messages-strategies and types, finding, evaluating and processing information, communication through visuals, writing business reports and proposals, planning oral presentations, writing oral presentations and mastering the art of delivery, overcoming anxiety, handling questions responsively, using visual aids in oral presentations, planning effective slides for oral presentations

UNIT-3:

Analyzing, writing and presenting a business case: Understanding the Case Method of learning, different types of cases, overcoming the difficulties of case method, reading a case properly-previewing, skimming, reading and scanning, case analysis approaches, Do's and don'ts of case reporting, steps for oral case presentations, reviewing the oral case analysis.

UNIT-4:

Corporate Communication: Corporate Communication-definition, concept and theories, an overview of corporate communication function in India, communicating with corporate brand, developing a reputation platform, communicating with key stakeholders: Internal and external communication, assessing the effectiveness of corporate communication, organizing corporate communication.

UNIT-5:

Crisis Communication and Media Management: Defining a corporate crisis, management mind sets that impede crisis management, four states of a crisis, crisis management process, writing a crisis management plan, developing a communication strategy to handle crisis, implement and evaluating a crisis management plan, inviting media response, writing press releases, conducting press conferences, preparing for media interview, post interview evaluation.

Text Books:

1. Business Communication Today, Bovee, Schatzman, Pearson (7th Edition)
2. Advanced Business Communication, J.M. Penrose, R.W. Rasberry, R.J. Myers, Thompson Learning (2nd Ed)
3. Essentials of Corporate Communication, B.M. Cees, Van Reil, C.J. Fombrun, Routledge.
4. Strategic Corporate Communication, P.A. Argenti, Tata McGraw-Hill.
5. C.L. Bovee and J.V. Thill, **Business Communication Today**, 10th Edition, Pearson.
6. Dalmar Fisher, Communication in Organization, 2nd Edition, Jaico Publishing House, New Delhi.
7. P.A. Argenti**, Strategic Corporate Communication**, 4th Edition, Tata McGraw-Hill.

Reference Books:

1. Michael B. Goodman and Peter B. Hirch**, Corporate** Communication- strategic adaptations for global practice**,** Peter Lang Publishing, New York.
2. B.M. Cees, Van Reil, C.J. Fombrn, **Essentials of Corporate Communication**, 1st edition, Routledge.
3. Owen Hargie, David Dickson and Dennis Tourish, **Communication Skills for effective management**, 1st Edition, Palgrave, Macmillan.
4. Meenakshi Raman and Prakash Singh, **Business Communication, Second Edition,** Oxford University Press**.**

Department of MBA
Detailed Syllabus for MBA
Batch: 2016-18

Course Title: **Business Economics**	Course Code: **GAA020**
Credit: 3	L **3** T **0** P **0**
Year: **1st**	Semester: **I**

UNIT-1:

Managerial Economics: Introduction, Nature and Scope, Objectives of the Firm, Theories of the Firm- Sales and Revenue Maximization Theory, Profit Maximization Theory, Behavioural Theories.

UNIT-2:

Demand Analysis: Demand- Meaning, Types and Determinants of Demand, Demand Function- Law of Demand, Law of Supply, Elasticity of Demand- Methods, Determinants and Managerial Uses. Demand Forecasting- Purpose, Quantitative and Qualitative Techniques of Demand Forecasting, Criteria for Good Forecasting Method.

UNIT-3:

Production Analysis: Production Function- Law of Variable Proportions, Isoquant and Isocost Curves, Least Cost Combination, and Law of Returns to Scale, Cobb-Douglas Production Function and Constant Elasticity of Substitution, Cost Concepts, Cost Oriented Pricing Methods.

UNIT-4:

Market Analysis: Market Structures, Output and Pricing Decisions- Perfect Competition, Monopoly, Oligopoly and Monopolistic Competition, Profit- Meaning and Theories.

UNIT-5:

Pricing Strategies, Full Cost, Product Line Skimming and Penetration Pricing, Concept of National Income, Methods of measurement of National Income, Concept of Inflation, Measures to Control, Concept and phases of Business Cycle.

Text books & Reference Books:

1. Dean, Joel, Managerial Economics, Prentice Hall India (2007).
2. Peterson, H. Craig, Lewis, W. Chris and Jain, Sudhir K. Managerial Economics, Pearson Education (2006).
3. Mehta, P.L., Managerial Economics: Text and Cases, S. Chand and Co. (2007).
4. Sameulson, Paul A. and Nordhaus, William D., Economics, .
5. Dewett, K.K., Modern Economic Theory, S. Chand and Co. (2006)
6. Mansfield, E., Allen, W.B. and Doetry, N.N., Managerial Economics: Theory, Applications and Cases, WW Norton and Company (2002).

Department of MBA
Detailed Syllabus for MBA
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Course Title: **Business Law**	Course Code: **GAA030**
Credit: 2	L **2** T **0** P **0**
Year: **1st**	Semester: **I**

UNIT-1:
Law of Contract: Definition, offer and acceptance, consideration, capacity of parties, free consent, legality of object, Performance and discharge of contract and remedies for breach of contract, Introduction to the concept of agent and different types of mercantile agents.

UNIT-2:
Sale of Goods Act: Meaning, formation of contract, Meaning of condition and warrantee. Difference between transfer of property and possession, principle of caveat emptor, rights of an unpaid seller.

UNIT-3:
Negotiable Instruments: Bills of Exchange, Promissory Note, Cheques: Rules regarding the crossing of cheques, dishonour of cheques and liability of banker and drawer, Holder and holder in due course.

UNIT-4:
Company law: Characteristics of company, distinction between company and partnership, Kinds and formation of company, memorandum and articles of association.

UNIT-5:
Factories Act: Health, Safety and Welfare Provisions.
Essentials of Industries (Development & Regulations) Act, 1951.

Text Books:

1. Kapoor N.D., Elements of Mercantile Law, Sultan Chand & Sons (2001).
2. Singh Avtar, Company Law (2007).
3. Singhania V.K., Direct Tax Laws (2010).
4. Avatar Singh, Law of Contract and Specific Relief,, Eastern Book Company, Lucknow (2009).
5. Avatar Singh, Introduction to Law of Negotiable Instruments, Eastern Book Company, Lucknow (2009).
6. N.D. Kapoor,Mercantile Law,2005 Sultan Chand & Sons, New Delhi (2009)
7. S.S. Gulshan, Business Law, 4th Edition, Excel Books, New Delhi, 2012.
8. Dr. P.C. Tulsian, Mercantile Law for CA-CPT, Tata McGraw Hill education, New delhi, 2007.
9. Dr. Avtar Singh, Business Law, 9th Edition, Eastern Book Company, Lucknow, 2011.

Reference Books:

1. S.K. Tuteja, Business Law for managers, 1st edition Sultan Chand & Sons, New Delhi 2007.
2. Dr. Avatar Singh, Law of Contract and Specific Relief, 11th Edition, Eastern Book Company, Lucknow, 2013.

Department of MBA
Detailed Syllabus for MBA
Batch: 2016-18

Course Title: **Financial Accounting and Analysis**	Course Code: **GAA040**
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: **I**

UNIT-1

Introduction to Accounting: Definition, Nature, Objectives, Scope, Accounting Cycle, types of accounting and Limitations of Accounting, Accounting concepts, conventions and principles; accounting equation, systems of book keeping IFRS.

UNIT-2

Mechanics of Accounting: Double entry system of accounting, journalizing of transactions; Posting Transactions into Ledger, Sub-division of Journals, Preparations of Trial Balance, Preparation of final accounts with adjustments.

UNIT-3

Financial Statement Analysis: Financial Statements - Meaning, Nature and Limitations. Reconstruction of Income Statement and Position Statement. Meaning of Financial Analysis. Significance of Financial Analysis to Different Parties. Vertical Vs. Horizontal Analysis. Internal Vs. External Analysis

UNIT-4

Techniques of Financial Analysis: Accounting Ratios - Meaning, Significance and Limitations. Classification of Accounting Ratio. Computation and interpretation of Liquidity Ratios. Leverage Ratios. Activity/ turnover Ratios and Profitability Ratios. Funds Flow Statement - Meaning and Need. Preparation and Interpretation of schedule of working capital changes and Funds Flow Statement. Cash Flow Statement - Meaning, Need, Preparation and Interpretation(AS3)

UNIT-5

Budgetary Control and Decision Making*:* Concept of Budget and Budgetary Control; Types of Budget: Cash Budget and Flexible Budgets. Cost Volume Profit Making Analysis, Concept of Marginal Costing, Differential Costing and Absorption Costing

Text Books:

1. Robert n Anthony, Hawkins and Merchant, Accounting TMH
2. Maheshwari S.N & Maheshwari S K – An Introduction to Accountancy (Vikas, 9th Edition)
3. Tulsian PC "Financial Accounting, Pearson Education
4. Khan, M.Y., and P.K. Jain, Management Accounting, 6th ed., Tata McGraw Hill, New Delhi, 2009
5. Ashish Bhattacharyya, Essentials of Financial Accounting, PHI
6. Chandan Sengupta, Financial Analysis and Modeling using Excel and VBA, 2nd Edition, Wiley India Pvt. Ltd., New Delhi, 2011.

Reference Books:

1. Martin Fridson& Fernando Alvarez, Finance Statement Analysis, 4th Edition, Wiley India Pvt. Ltd.-New Delhi, 2011.
2. Donna Phil brick & Charles T. Horngren, Introduction of Financial Accounting, 9th Edition, Pearson education, New delhi, 2008.
3. T.P. Ghosh, Accounting for Managers, 4th Edition, Taxmann's Publication, New Delhi 2009.
4. Prasanna Chandra, Finance Sense: Finance for Non- Finance Executives, 4th Edition, McGraw Hill Education, New Delhi, 2012.

Department of MBA
Detailed Syllabus for MBA
Batch: 2016-18

Course Title: **Management Concepts**	Course Code: **GAA050**
Credit: 2	L **2** T **0** P **0**
Year: **1st**	Semester: **I**

UNIT-1

Introduction to Management- Definitions, nature and scope of management, functions and process of management, Management-science or art? Patterns of management analysis from Taylor, Fayol, Max Weber to the present. Growth of professional management in India. International Management-cultural and country differences., management and society-Environment, social responsibility and ethics.

UNIT-2

Essentials of Planning-Planning process, types of plans, Forecasting and its techniques, Managerial decision-making process and models, Concepts of MBTO & MBTE. **Organization:** Organizational theories and design, various forms of organization structures, span of management principles of coordination, Authority, Power, delegation, decentralization and Empowerment.

UNIT-3

Staffing & Managerial Communication: Meaning & process of staffing, recruitment & selection, training & development, job analysis & appraisal. Meaning & scope of communication, Importance of communication in management, the communication process and its types, Barriers to effective communication.

UNIT-4

Leadership and motivation: meaning, nature, scope of leadership, theories of leadership and its implications, leadership styles and managerial grid, importance of motivation and its types, theories of motivation.

UNIT-5

Nature & scope of managerial control, types of control systems and techniques – budgetary and statistical quality control, Japanese management techniques, TQM, Kaizen, JIT, The peter's principle. Concept of coordination. Management of change-Resistance to change, change models, change agents.

Text Books:

1. Essentials of Management; Koontz and O"Donnell. E; McGraw Hill,
2. Introduction to Management; Fred Luthans; McGraw Hill

Reference Books:

1. The Practice of Management; Peter F. Drucker

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Course Title: **Marketing Management**	Course Code: **GAA060**
Credit: 3	L **3** T **0** P **0**
Year: **1st**	Semester: **I**

UNIT-1:
Marketing Concepts: Nature and Scope of Marketing, Core Marketing Concepts, And Company Orientation toward the Marketplace

UNIT-2:
Marketing Enablers: Marketing Environment, Consumer Markets, Business Markets, Buying Decision Process, Participants in the Buying Process

UNIT-3:
Strategic Marketing: Strategic Planning, Marketing Planning, Market Segmentation, Targeting and Positioning.

UNIT-4:
Marketing Mix: Product Decisions, Pricing Methods and Strategies, Promotion Mix, Place, Marketing Plans Implementation, Evaluation and Control.

UNIT-5:
Contemporary Issues in Marketing: Globalization, Consumerism, Green Marketing, Legal Issues-Consumer Protection Act.

Text books & Reference Books:

1. Kotler, P., Marketing Management, Prentice Hall (2007)
2. Ramaswamy, V. S. and Kumari, N., Marketing Management-Planning, Implementation and Control, McMillan India (2006)
3. Saxena, R., Marketing Management, Tata McGraw Hill (2003)
4. Lilien, Gary L.; Rangaswamy, Arvind and Bruyn, Arnaud De, Principles of Marketing Engineering, Trafford Publishing (2007)

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Course Title: **Organizational Behaviour**	Course Code: **GAA070**
Credit: 3	L **3** T **0** P **0**
Year: **1st**	Semester: **I**

UNIT-1:
Organizational Behavior- Nature, Importance and Scope; Models of OB; Managing Workforce Diversity; Emerging Challenges for Management and OB, Determinants of Individual Behavior.

UNIT-2:
Foundations of Individual Behavior- Values, Attitudes, Personality, Perception and Emotions; Transactional Analysis; Johari Window; Motivation- Importance and Theories; Determinants of Personality; Personality Attributes influencing OB; Interactive Behavior and Interpersonal Conflict.

UNIT-3:
Foundations of Organizational Structure, Work Design and Technology, , Organizational Culture & Climate, Organizational Learning- Importance and Theories; Learning and Behavior Modification; Principles of Learning & Reinforcement.

UNIT-4:
Team Building and Group Dynamics; Working Teams and Team Effectiveness; Intra-Team Dynamics; Dynamics of Managerial Leadership; Leadership- Transition of Leadership Theories; Implementation of Leadership Theories in Contemporary Business Environment.

UNIT-5:
Organizational Conflicts; Power & Politics –Concept of Authority & Power; Sources of Power, Unequal Power in Organization, Organizational Politics, Dysfunctional Aspects of Politics, Organizational Communication, Functional and Dysfunctional Conflicts, Stages in Conflict.

Text Books:

1. Organizational Behaviour, Understanding and Managing life at work, 7th Ed., Johns, G., & Saks, A. Pearson.
2. Organizational Behaviour, 7th ed. ,by Luthans, Fred McGraw-Hill, New York
3. Organizational behaviour,9th edition by Stephen P.Robbins. Prentice Hall International, Inc..
4. Luthans, Fred, Organizational Behaviour: An evidence based approach, 12th edition. Tata McGraw Hill

Reference Books:

1. Johns, G., and Saks, Organizational Behaviour- Understanding and Managing life at work, 7th Ed., Pearson.
2. Gerard H. Seijts, Cases in Organization Behavior, 1st Edition, Sage.
3. Jerald Greenberg, Behavior in Organizations, 10th Edition, Prentice Hall.
4. Uday Pareek, Understanding Organizational Behavior**,** 3rd Edition, Oxford University Press,

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Course Title: **Statistics for Business Decisions**	Course Code: **GAA080**
Credit: 4	L **4** T **0** P **0**
Year: **1st**	Semester: **I**

UNIT-1

Introduction to the Practice of Statistics, Measures of Central Tendency- mean, median, mode, Properties and applications, Measures of Dispersion: Range, Mean deviation, Standard deviation, Coefficient of Variation, Skewness, Kurtosis.

UNIT-2

The Concept of Probability. Sample space and Events, The addition rule and complements Conditional Probability & the General Multiplication Rule. Random variable (discrete and continuous) and probability distribution, Properties of the Normal Distribution, The Binomial Probability Distribution, The Poisson Probability Distribution

UNIT-3

Hypothesis in Business Decisions (Basic Concepts), Estimation Theory and Hypothesis Testing: Sampling theory; Formulation of Hypotheses; Application of Z test, t-test, F-test and Chi-Square test.

UNIT-4

Concept of Correlation and Regression and its types, Karl Pearson correlation, Linear regression defined, An overview on regression, testing the Significance of the Least-Squares Regression Model, Multiple and partial correlation and regression.

UNIT-5

Time Series Analysis: Concept and applications in business decision-making, Additive and Multiplicative models, Components of time series, Trend analysis: Least Square method - Linear equations

Text Books:

1. Robert n Anthony, Hawkins and Merchant, Accounting TMH
2. Ghosh T P - Accounting and Finance for Managers (Taxman, 1st Edition).
3. Maheshwari S.N & Maheshwari S K – An Introduction to Accountancy (Vikas, 9th Edition)
4. Tulsian PC "Financial Accounting, Pearson Education
5. Khan, M.Y., and P.K. Jain, Management Accounting, 6th ed., Tata McGraw-Hill, New Delhi, 2009
6. Ashish Bhattacharyya, Essentials of Financial Accounting, PHI

Reference Books:

1. Business Statistics : For Contemporary Decision Making by Ken Black, , Publisher: Wiley
2. Statistics for Managers Using Microsoft Excel and Student CD Package (4th Edition) by David M Levine, David Stephan, Timothy C. Krehbiel, Mark L. Berenson, Hardcover: 880 pages, Publisher: Prentice Hall
3. Business Statistics using Excel, Glyn Davis and BrankoPecar, Oxford University Press, USA

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Course Title: **Business Research Methods**	Course Code: **GAB010**
Credit: 4	L **4** T **0** P **0**
Year: **1st**	Semester: **II**

UNIT-1:
Introduction to Business Research Methods: Concept and Nature of Research Methods, Types of Research, Applications of Research Methods in Business, Research Process.

UNIT-2:
Types of Research Design: Exploratory, Descriptive and Experimental, Development of Research Designs, Problem identification, Types of Sampling Methods, Sampling Process, Sampling Design Preparation.

UNIT-3:
Types of Data: Primary and Secondary, Sources of Secondary Data, Methods of Primary Data Collection – Interviews, Questionnaires, Schedules and Observation, Likert, Turnstone, Staple, Semantic, Constant Sum, Rating and Ranking Scales, Questionnaire Designing, Manual and Computerized Data Processing Methods.

UNIT-4:
Statistical Techniques for Data Analysis: Testing of Hypothesis, Interpreting Data; Report Writing, Ethical Issues in Business Research and Measurement of Effectiveness.

UNIT-5:
Introduction to Multivariate Analysis: Factor Analysis, Discriminant Analysis, Cluster Analysis, and Conjoint analysis.

Text Books & Reference Books:

1. Umasekaran, B., Research Methods for Business, John Wiley and Sons (2005).
2. Saunders, M. and Lewis, P., Research Methods for Business Students, Prentice Hall
3. Business Research Method , W. Zikmund Thomson Publication

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Course Title: **Consumer Behaviour**	Course Code: **GAB020**
Credit: 2	L **2** T **0** P **0**
Year: **1st**	Semester: **II**

Unit I:
Introduction to Marketing & Consumer Behavior, Psychology & Consumer Behavior, Buyer Various Aspects, Models of Comprehensive Buyer Behavior, Overview of Consumer Behavior Decision Process, Case study

Unit II:
Culture, Social Class Variables Impacting Consumer Behavior, Sub Culture, Reference Group Variables Impacting Consumer Behavior, Family Variables Impacting Consumer Behavior, Learning and Memory, Case Study

Unit III:
Personality and concept of self, Motivation, Emotion, Perception, Information Processing, Problem Recognition, Case Study

Unit IV:
Individual Determinants of Consumer Behaviour – Needs and Motivation, Personality and Self Concept, Perception, Learning, Attitude

Unit V:
Models of Industrial Buying Behavior, Patterns of Industrial Buying Behavior in India, Diffusion of Innovation, Perception, Trust, Selectivities, Cross-cultural Consumer Behavior, Case Study

. **Text Books**

1. Consumer Behaviour and Branding: Concepts, Readings and Cases-The Indian Context, S Ramesh Kumar
2. Hoyer, Wayne and Deborah McInnis. *Consumer Behavior*. Boston: Houghton Mifflin
3. Kardes, Frank (2008), Consumer Behavior Science and Practice, Sputh-Western
4. Solomon, Michael, Gary Bamossy, Søren Askegaard, and Maragreth Hogg (2009), Consumer Behaviour: A European Perspective, 3rd Edition, Pearson

Reference:

1. Roger D Blackwell ,Paul W Miniard ,James F Engel, "Consumer Behavior", 1st India Edition, 2008, South Western
2. Del Hawkins, David Mothersbaugh, Amit Mookerjee, "Consumer Behavior: Building Marketing Strategy", 11th Edition, 2010, , Tata McGraw Hill
3. Consumer Behaviour: Global Edition, 10/E, Michael Solomon, Pearson Higher education
4. Consumer Behaviour**,** Jim Blythe, 2nd edition, Sage publication

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Course Title: **Corporate Finance**	Course Code: **GAB030**
Credit: 3	L **3** T **0** P **0**
Year: **1st**	Semester: **II**

UNIT-1:
Introduction to corporate finance: Types of financial management decisions, the role of the financial manager, forms of business organizations, the goal of financial management, balance sheet, income statement, cash flow, Financial statement analysis.

UNIT-2:
The time value of money: Time value of money, simple interest vs. compound interest, cash flow diagrams, future value and compounding, present value and discounting, uneven cash flow and annuity, calculate present worth, future worth and annual worth, discounted cash flow valuation, effective interest rate, annual percentage rate, multi period interest, continuous compounding, capital recovery and sinking fund model.

UNIT-3:
Risk and return analysis: Capital market theory, arbitrage pricing theory, cost of capital, relationship between risk & return, measurement of risk & return, holding period return, current yield, risk aversion, systematic risk, unsystematic risk, security market line, capital asset pricing model.

UNIT-4:
Capital Structure and Financing Decisions: The elements and role of financial planning, theories of capitalization, capital structure, Financing Decisions and Efficient Capital Market, Long−Term Financing: An Introduction, Capital Structure: Basic Concepts, Capital Structure: Limits to the Use of Debt, Cost of capital, financial leverage, capital structure, OI, NOI and M&M proposition I and II.

UNIT-5:
Investment and Dividend Decisions: Long term vs. short term investment, Concepts and procedures of capital budgeting, investment criteria (net Present value, payback, discounted payback, average accounting return, Internal rate of return, profitability index), working capital management, operating cycle method, dividend policies, relevance vs. irrelevance, Walter model, Gordon model, M&M approach

Text Books:

1. Ross, Westfield & Jaffe, The McGraw-Hill Companies, Inc., 2009.
2. Principles of Corporate Finance, 9th ed., Brealey, Myers & Allen, The McGraw-Hill Companies, Inc., 2007.
3. Financial Management: Theory and Practice, Brigham & Ehrhardt, 10th edition, Cengage Learning, 2002.
4. Fundamentals of Financial Management, 12th edition, Horne & Wachowicz, Pearson Education, Inc., 2005
5. Bearly,Myers and Allen, Principles of Corporate Finance, 9th, McGraw Hill, New York, 2014
6. AswathDamodaran, Damodaran on Valuation: SECURITY ANALYSIS FOR INVESTMENT AND CORPORATE FINANCE, 2nd, Wiley & Sons, New Jersey, 2014

Reference Books:

1. I M Pandey, FINANCIAL MANAGEMENT, 9th, Vikas Publishing House, New Delhi, 2014
2. Berk, Jonathan, and Peter De Marzo, Corporate Finance, 2nd, Prentice Hall, New Jersey, 2010

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Course Title: **Global Business Environment**	Course Code: **GAB040**
Credit: 2	L **2** T **0** P **0**
Year: **1st**	Semester: **II**

UNIT-1:
Global Business Environment: Definition, Concept and Scope, Components and Significance- Economic, Political, Social, Cultural, Legal and Technological Environment, Dimensions of International Business Environment and Challenges- Recent World Trade and Foreign Investment Trends.

UNIT-2:
Indian Economic Environment: Structure of Indian Economy- Public, Private, Joint and Co-operative Sectors, Overview of Planning in India, Industrial Policy, Trade and Commerce Policy, and Foreign Policy, Emerging Trends in Indian Business Environment, Indian Companies- Competitiveness, Changes and Challenges.

UNIT-3:
Economic Systems and Dynamics: International Trade Theories, Balance of Payments- Concepts, Disequilibrium in BOP and Methods of Correction, Overview of Indian Financial System.

UNIT-4:
Globalization and International Trade: International Economic Integration- Country Evaluation and Selection, Foreign Market Entry Methods, Trade Barriers and Trade Strategy- Free Trade vs. Protection, International Trading Blocks- EU, NAFTA, Asian Common Market, AFTA and SAARC, Impact of WTO on India.

UNIT-5:
International Institutions: WTO, IBRD (World Bank), IMF, IFC and ADB- Objectives, Organization Structure and Functioning.

Text Books:

1. A.C. Fernando, ***Business Environment***, Pearson Education.
2. Justin Paul , ***BUSINESS ENVIRONMENT: TEXT & CASES***, Tata McGraw-Hill Education
3. Cherunilam, F., Business Environment, Himalaya Publishing House (2007).
4. Cavusgil, S. Tamer, Gary Knight, John R. Riesenberger, International Business: Strategy, Management and New Realities, Pearson Education (2009).

Reference Books:

1. Hill, Charles W., Arun K. Jain, International Business, Tata McGraw Hill (2008).
2. Richard, M.S. and Luciara, N., Managing in the Global Environment, PHI (2006).

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Course Title: **Human Resource Management**	Course Code: **GAB050**
Credit: 3	L **3** T **0** P **0**
Year: **1st**	Semester: **II**

UNIT-1:
Human Resources Management: Definition, scope, objective and functions of Human Resources Management Human Resources Policy: Definition, importance, characteristics of good HR Policy Human Resources Planning: Definition, importance, barriers of HR Planning, HR Planning Process.

UNIT-2:
Job Analysis and Design: Definition, Process of Job Analysis, Job Design, Factors affecting job Design, Process of Job Design. Human Resource Recruitment: Definition, factors governing recruitment, recruitment process. Selection: Definition, Selection Process. Placement: Meaning, Problems in Placement.

UNIT-3:
Orientation: Meaning, typical Orientation Program, Evaluation of and Problems in Orientation, Promotions and Transfers, Retrenchment and VRS. Training and Development: Inputs in Training and development, Training Process, deriving Instructional Objectives, Design, Implementation and Evaluation of the Training Programme. Performance Management- Different elements of Performance Management, process and evaluation techniques, issues and dilemmas, context and design model of system.

UNIT-4:
Employee Remuneration: Components of Remuneration, Fringe Benefits, Perquisites, Non Monetary benefits, Remuneration Plans, Devising Remuneration Plans, Concepts of Wages, Minimum Wages, Fare Wages. Incentive payments: Meaning, Types of Incentive system Human Resource Management and Ethics: Importance of HRM ethics, Ethical Issues in HRM Employee Welfare: Meaning, Types of Welfare Activities, welfare facilities by the Government, Welfare Activities by the Trade Unions.

UNIT-5:
Balance Scorecard –Factors that led to thinking about scorecard approach, idea Underling BSC, Research by Kaplan and Norton Introducing BSC- step By- Step, case studies project work.

Text Books:

1. Gary Dessler: Human Resource Management, Pearson Education India.
2. VSP Rao: Human Resource Management, Excel Books
3. Arun Monappa: Managing Human Resources, McMillan
4. Kesho Prasad: Strategic Human Resource Management, Prentice Hall India
5. K. Aswathappa, Human Resource Management, 7th Edition, Tata McGraw-Hill 2013, New Delhi.
6. P. Subba Rao, Essentials of Human Resource Management & Industrial Relations, Third Edition, Himalaya Publication House, 2008, Mumbai.

Reference Books:

1. Micheal Armstrong, A handbook on Human Resource Management, 10th Edition, Kogan pae limited, 2007, USA
2. John Bratton & Jeff Gold, Human Resource Management-Theory & Practices, Palgrave Macmillan, 2012.
3. H. John Bernardin, Human Resource management- An Experential Approach, 4th Edition, Tata McGraw-Hill, Noida,2007
4. VSP Rao, Human Resorce Management, 2nd Edtition, Excel Books, 2008, New Delhi.

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Course Title: **Managerial Decision Modeling**	Course Code: **GAB060**
Credit: 4	L: **3** T: **0** P: **1**
Year: **1st**	Semester: **II**

UNIT-1:
Overview on decision modelling, types of models, steps involved in decision modelling, problems in developing decision models, modelling through spreadsheet- hands on examples.

UNIT-2:
Linear programming models- concept, assumptions and applications, Formulating a linear programming model, graphical solution to LPP with two variables, Simplex algorithm

UNIT-3:
An introduction to transportation models, VAM and MODI methods, Unbalanced transportation models, Overview of assignment models

UNIT-4:
Overview on decision analysis, steps involved in decision analysis, Decision Tree Analysis, Forecasting models

UNIT-5:
Queuing models, characteristics of a queuing system, types of queuing systems, An overview on simulation modeling, Monte Carlo simulation, role of computers in simulation,.

Text Books:
1. Wayne L. Winston, Practical Management Science: spreadsheet modeling and applications
2. Taha, Hamdy, Operations Research, 7thedition, (USA: Macmillan Publishing Company), 2003
3. Vohra; Quantitative Techniques in Management (Tata McGraw-Hill, 2nd edition), 2003.
4. J K Sharma; Operations Research (Pearson)

Reference Books:
1. Managerial Decision Modelling with Spreadsheets; Nagraj Balakrishnan et al, Pearson Publication

List of Experiments

Exercise-1: Linear programming modeling applications with Excel.
Exercise-2: Sensitivity analysis Exercises
Exercise-3: Solving transportation models using Excel
Exercise-4: Solving assignment models using Excel
Exercise-5: Using Excel to solve decision making under uncertainty and risk
Exercise-6: Using TreePlan to solve decision tree problems with Excel
Exercise-7: Using Excel for basic time series forecasting models
Exercise-8: Using Excel Units for queuing model computations

Text Books & Reference Books:
1. Managerial decision modeling with Spreadsheets; Nagraj Balakrishnan et al, Pearson Pub.
2. Wayne L. Winston, Practical Management Science: spreadsheet modeling and applications

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Course Title: **Operation Management**	Course Code: **GAB070**
Credit: 3	L **3** T **0** P **0**
Year: **1st**	Semester: **II**

UNIT-1:

Introduction to Operations Management: Operations Management Defined, Need of Operations Management, Nature & Scope of Operation Management, Relationship with other functional areas, Concept of Goods vs Services, Overview of Operations Strategy, and Theory of Slack Ropes.

UNIT-2:

Product and Process Design: Introduction to Process design, Product – process matrix, Process design in Services, Product Design and Service Design, Design for manufacturing, Design for AsseMBTly and modular design, Concept of Quality Function Deployment and House of Quality.

UNIT-3:

Facility Layout and Location Selection: Concept of Facility Location and various methods for location selection, Facility Layout: Product layout, Process Layout, Hybrid and other forms of layout, Advantages and Disadvantages.

UNIT-4:

Overview of Supply Chain and Inventory management: Introduction to Supply Chain Management and its importance in Operations management, Bullwhip Effect Inventory Management, WIP, EOQ Model, ABC Classification, Forecasting and its different methods, Capacity Planning and Aggregate Production Planning, MRP, Scheduling.

UNIT-5:

Quality Management: Overview of Quality Management, Quality: Definition, Dimension, Types of Waste, KANBAN System, Total Quality Management (TQM), Overview of Six Sigma.

Text Books:

1. Chase, Aquilano and Jacobs, Production and Operations Management, Tata McGraw- Hill (2006).
2. Russell, R. S. and Taylor III, B. W., Operations Management, Pearson Education (2006).
3. Lee J. Krajewski & Larry P. Ritzman, Operations Management: Strategy and Analysis, Pearson Education (2006).
4. Evans and Collier, Operations Management, Cengage Learnings (2007)
5. Gaither and Freizer, Operations Management, Cengage Learnings (2004)
6. P. Rama Murthy, Production and Operation Management, 3rd Edition, New Age International Publishers, New Delhi, 2013.
7. Shailendra Kale, Production & Operation Management, 1st Edition, Mc Graw Hill, Mumbai,2013.
8. Prof. K. C. Jain, Dr. P. L. Verma, Mr. Prabhat Kartikey, Production and Operation Management, Wiley India Pvt. Ltd., New Delhi.
9. Martin K. Starr, Production and Operation Management (Biztantra), Wiley India Pvt. Ltd. , New Delhi.

Reference Books:

1. Jack R. Meredith and Scott M. Shafer, 5th Edition, International Student Version, Wiley, New Delhi, 2012.
2. R.B. Khanna, Production and Operation Management,
3. P.B. Mahapatra, Operation Management-A Quantative Approach, PHI, Delhi,
4. J.P. Saxena, Production and Operation Management, 2nd Edition, Tata McGraw hill education, New Delhi, 2012.

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Course Title: **Business Simulation**	Course Code: **GAB180**
Credit: 2	L **1** T **0** P **2**
Year: **1st**	Semester: **II**

About MikesBikes-Intro (MB-I)

It is an Online Business Simulation that will give you the opportunity to run your own company that deals in Bicycle Manufacturing. Students shall be managing all the key functional areas of a Firm involving critical price, marketing, operations, product development, and financial decisions.

Week wise Course Delivery Plan

Week -1	Introduction to Mike Bikes and Learning Plans through team based decisions
Week -2	First Interface with simulation on Single player Version(Practice)
Week -3	Practice Rollover 1 on Multi-player Version
Week -4	Practice Rollover 2 on Multi-player Version
Week -5	Start of Competition – Rollover1 (Year1 decisions to be taken)
Week -6	Competition – Rollover2 (Year2 decisions to be taken)
Week -7	Competition – Rollover3 (Year3 decisions to be taken)
Week -8	Competition – Rollover4 (Year4 decisions to be taken)

Pedagogy

This course shall be delivered through a competition based format where in class is divided into 20 teams having 3-4 members in each team. Simultaneously, 5 teams will be in direct competition i.e. shall be competition with each other and hence shall form WORLD1. In total there will be 4 Worlds having 5 teams in each. Each team shall analyze various reports and take certain decisions so that overall shareholders' value for their respective firm is increased. After every Rollover i.e. submitting their decisions for a given year, the performance of each team shall be analyzed and evaluated.

Course Title: **Comprehensive Viva Voce**	Course Code: **GAB190**
Credit: 1	L **0** T **0** P **2**
Year: **1st**	Semester: **II**

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Course Title: **Business Ethics and Corporate Governance**	Course Code: **GAC010**
Credit: 2	L **2** T **0** P **0**
Year: **2nd**	Semester: **III**

UNIT-1:
Introduction to Business Ethics: An understanding of Ethics ,Meaning of Ethics, Def. of Business Ethics, Ethical Performance ,Types of Ethics, Sources of Ethics, Ethics and Business ,Importance and Scope of Ethics, Factors influencing Business Ethics, Objective of Business Ethics, Morality and Ethics.

UNIT-2:
Values, Norms, Beliefs and Standards: Ethical Codes, Managing Ethics, Ethical Activities, Ethical Dilemmas, Whistle Blowing.

UNIT-3:
Ethical Decision: Making the role of Moral Philosophies in Decision Making, Ethical Organisation, Ethical Issues that arise for Mangers, Kohlenberg's Model, Carrol Gilligan's Model.

UNIT-4:
Ethical Practices in Business Management: Application in Marketing, Advertising, Finance- Tax Evasion, Lack of Transparency, Preparing False Financial Statement, Speculation and Insider Trading. Application in HRM area like Compensation, and Work Place Harassment of Employee.

UNIT-5:
Corporate Governance: Introduction, Concept and Need for Corporate Governance, Definitions, Parties to Corporate Governance, Agency Theory, Stewardship Theory, Popular Model for Governance, Anglo-American Model, Japanese Model and Indian Perspective of Corporate Governance.

Text Books:

1. CSV Murthy, Business Ethics (Text and Cases), HPH
2. Prof.(Col) P.S. Bajaj, Dr. Raj Agarwal, Business Ethics –An Indian perspective, Biztantra
3. John R. Beatright, Ethics and the Conduct of Business, Pearson Education
4. A.C. Fernando, Business Ethics and Corporate Governance, 2/e, Pearson Education.
5. Andrew Crane & Dirk Matten, Business Ethics, 2nd Edition, Oxford university press.
6. A.C. Fernando, Corporate Governance: Principles, Polices and Practices, 2/e, Pearson Education
7. Jayati Sarkar, Corporate Governance in India, 2012, SAGE India

Reference Books:

1. Marianne M. Jennings, Cases in Business Ethics, Cenage Learning
2. Dr. Sanjay Mohapatra, Case Studies in Business Ethics and Corporate Governance, Pearson Education.
3. Ananda Das Gupta, Ethics, Business and Society**:** Managing Responsibly, 2010, SAGE

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Course Title: **B -2- B Marketing *(Elective-1)***			Course Code: **GAD610**
Credit: 3	L **3**	T **0**	P **0**
Year: **2nd**			Semester: **III / IV**

Unit I: Introduction to B-2-B Marketing

Meaning, Definition, importance, Business Models - B-2-B marketing, B-2-C, C-2-C marketing, Typical challenges in B-2-B Marketing

Unit II: Business Buyer Behavior:

Business buying vs. individual buying, Business buying process, Business buying situations, Business buying roles, Marketing research

Unit III: Segmentation, Targeting and Positioning in business buying

Segmentation of business markets, Targeting strategies, developing positioning strategies for business markets

Unit IV: Product and Pricing decision

Product classification in business markets, product decisions, branding decisions, Product life cycles, new product development

Unit V Distribution and marketing communication:

Setting up Distribution channel, Channel types, Designing communication for business buyers.

Text Book:

1. *Krishna Havaldar, Business Marketing , TMH publishers*

References Books:

1. Industrial Marketing, Milind t. Phadtare , PHI

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Course Title: **Digital and Social Media Marketing** ***(Elective-1)***	Course Code: **GAC620**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III / IV**

UNIT-1:
INTRODUCTION TO DIGITAL MARKETING
Digital Marketing Fundamentals – Definition, Different Terminologies (E-marketing, online marketing, web marketing, internet marketing), key constituents of Digital Marketing, scope of Digital marketing (Applications), Digital Marketing Plan, Concept of e-Business & e-commerce, Revenue or Business Models

Digital Marketing Revolution -Historical evolution of Internet, Changing face of media & Impact of Digital Channels, Digital Marketing Industry

Digital Marketing Environment - Political, Economic, Socio-cultural, Technological, Ethical and Legal Issues: Ethical codes, Privacy issues, Digital Property (Patents, Copyright, Trademarks, licenses), Different types of online payment modes, E-Security –Firewalls,

UNIT-2:
DIGITAL MARKETING STRATEGY
Digital Marketing Research - Data Driven strategy, Electronic Marketing information Systems, monitoring Social Media , Web Analytics tools

Online Consumer Behviour – Customer Personas, Online Consumer Behviour models, Online exchanges and outcomes.

Segmentation, Targeting and Positioning (STP) – three markets (Business, Government, Consumer), Segmentation bases (Geographic, Demographic, Psychographic, Behavioural), Targeting Online Customers, Differentiating and positioning Online

UNIT-3:
DELIVERING THROUGH DIGITAL MARKETING
Conceptualizing and Developing a Website – conceptualizing online Product (benefits, attributes, branding etc.), Researching Site User's requirement (Usability, Web Accessibility, and Localization), Reviewing Competitors' website, Designing the information architecture, Website Prototyping, Domain Name registration, Hosting a website.

Introduction to Website designing tools – Website designing editors (HTML, Dreamweaver 8), elements of site design, site design and structure, Page design, Content Design, Testing of Content, Other standardized website designing free resources (Google sites, blogs, Webs etc.)

Pricing and Distribution of Digital Offer.

UNIT-4:
DIGITAL MARKETING COMMUNICATION TOOLS
Integrated Marketing Communication (IMC), IMC tools, Differences in Advertising through traditional & Digital Media, Setting Online Marketing objectives - Conversion Marketing Objectives, Timescales for Objective setting, Campaign Cost Objectives

Online Promotion Techniques –

a) Search Engine Marketing - Search Engine optimization, Pay-per-click, Search Engine Marketing, Introduction to Google Adwords, Google Adsense

b) Interactive Advertising - Fundamentals and Purpose, Measurement, Interactive Ad targeting options, Interactive Ad formats, Making banner ads work, Buying Advertising

c) E-mail Marketing – Opt-in e-mail options for customer acquisition, Opt-in email options for Prospect Conversion and Customer retention(house list), Key success factors, Inbound e-mail communication

d) Online Public Relations

e) Online Partnerships - affiliate Marketing, Online sponsorship

f) Marketing using videos on Youtube, facebook etc.

g) Viral Marketing

UNIT-5:

MARKETING THROUGH SOCIAL MEDIA

The Horizontal Revolution, Strategic Planning with Social Media, The **four zones of social media**- Social Consumers, Social Communities , Social Publishing, Social Entertainment, Social Commerce, Creating and analyzing business pages on social networking sites such as Facebook, Twitter, Linkedin, Google+, role of Virtual communities and blogs, Social Media for Consumer Insight, Social Media Metrics, **Maintaining And Monitoring The Online Presence,**Defining Performance Metrics framework, Tools and techniques for collecting metrics and summarizing results, The Maintenance Process, Content Management Process.

Text Books & Reference Books

1. e-Marketing: Strass, El-Ansary, Frost
2. Social Media Marketing: Strategies for Engaging in Facebook, Twitter & Other Social Media by Liana Li Evans, Pearson Publication.
3. Social Median Marketing Book; By Dan Zarrel, O'Reilly Media.2009.
4. Digital Marketing: Strategy, Implementation and Practice, 5/E, Dave Chaffey, Pearson.

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Course Title: **Integrated Marketing Communication** ***(Elective-1)***	Course Code: **GAD630**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III / IV**

UNIT-1:
THE IMC FOUNDATION: Integrated Marketing Communications, Corporate Image and Brand Management, Buyer Behaviors, Promotions Opportunity Analysis

UNIT-2:
IMC ADVERTISING TOOLS: Advertising Management, Advertising Design: Theoretical, Frameworks and Types of Appeals, Advertising Design: Message Strategies and Executional Frameworks

UNIT-3:
IMC MEDIA TOOLS: Advertising Media Selection-active Marketing, Alternative Marketing.

UNIT-4:
IMC PROMOTIONAL TOOLS: Database and Direct Response Marketing, Sales Promotions, Public Relations and Sponsorship Programs

UNIT-5:
IMC INTEGRATION TOOLS: Regulations and Ethical Concerns, Evaluating an Integrated Marketing Program

Text Books & Reference Books

1. Integrated Advertising, Promotion and Marketing Communications, 4/e by Kenneth E. Clow Donald E. Baack Pearson Publication
2. Advertising and Promotion : An Integrated Marketing Communications Perspective (SIE)by George Belch, Michael Belch, Keyoor Purani, Tata Mcgrahill.

Department of MBA
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Batch: 2016-18

Course Title: **Product and Brand Management** ***(Elective-1)***	Course Code: **GAD640**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III / IV**

UNIT-1:
Product and brand strategy, Product strategy over the life-cycle, Customer analysis, Competitor analysis, Design of manufacture, Product life cycle & portfolio analysis, new product development process

UNIT-2:
Forecasting target market potential and sales, Methods of estimating market and sales potential, Sales forecasting,

UNIT-3:
Brands and Brand Management, significance of a brand –brand mark and trade mark – different types of brand – family brand, individual brand, private brand – selecting a brand name – functions of a brand – branding decisions – influencing factors.

UNIT-4:
Customer-based Brand Equity, Brand Positioning and Brand equity, Choosing Brand Elements to Build Brand Equity, Designing Marketing Programs to Build Brand Equity, Integrating Marketing Communications to Build Brand Equity, Developing Brand Equity Measurement and Management System, Measuring Sources of Brand Equity , measuring Outcomes of Brand Equity

UNIT-5:
Branding impact on buyers – competitors, Brand loyalty – loyalty programmes –brand equity – role of brand manager – Interrelations with manufacturing, marketing, finance, purchase and R & D – brand audit, brand development through acquisition , takes over and merger

Text Books & Reference Books

1. Kevin Lane Keller, "Strategic brand Management", Person Education, New Delhi, 2003.
2. Jean Noel, Kapferer, "Strategic brand Management", The Free Press, New York, 1992.
3. Product management - Donal R. Lehmann, Russel S. Winer
4. S.Ramesh Kumar, "Managing Indian Brands", Vikas publishing House (P) Ltd., New Delhi, 2002.
5. Jagdeep Kapoor, Brandex, Biztantra, New Delhi, 2005

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Detailed Syllabus for MBA
Batch: 2016-18

Course Title: **Retail Management** *(Elective-1)*	Course Code: **GAC650**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III/ IV**

Unit I:

Nature and Importance of Retailing:

Retailing And Retailers, Place Of Retailing In Marketing Mix, Retailing Economical And Social Importance, Size Of Retail Market, Operating Expenses And Profits. Retailing in India. Classifying Retail Firms: Firm Of Ownership, Operational Structure, Service And Price Orientation, Merchandise Offering.

Unit II:

Store & Non Store Retailing

Type of Merchandiser, Single Line Store, General Store, Variety Store, Departmental Store, Supermarket, Superstore, Combination Store, Hypermarket, Discount Store, Warehouse Showroom, Catalogue Storing, In Home Retailing, Retailers -Sponsored Cooperative Chain, Manufacturers - Sponsored Franchising System.

Unit III:

Retail Strategy and Planning

Retail Perspective, Understanding the Retail Customer, Store Locations

Unit IV:

Merchandise Management and Retail Decisions

Target Market Selection, Merchandise, Merchandise Planning and Management, Merchandise Buying, Retail Pricing and Merchandise Performance. Location, Size, Store Image, Design, Layout and Shop Design.

Unit V:

Creating & Sustaining Value and Trends in Retailing

Retail Marketing Communication, Servicing the Retail Customer, Supply Chain Management. Growth of Shopping Malls, Factory Outlet, Discount and Discount Malls.

Text Books:

1. David Gilbert, Retail Marketing Management, Pearson India
2. Robert f. Lusch, Patrick Dunne, Myron Gable, Retail Management, edition II, South western Pub. Co. Ohio
3. Pradhan Swapna, Retailing Management Text & Cases, TMH Publications, New Delhi.

Reference books:

1. Managing Retailing, 2/e, Piyush Kumar Sinha & Dwarika Prasad Uniyal, Oxford University Press

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Course Title: **Sales and Distribution Management** ***(Elective-1)***	Course Code: **GAC660**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III / IV**

UNIT-1:
Introduction to Sales Management: Concept, Nature, Role of Sales Management in Marketing, Salesmanship, Specific Characteristics of a successful salesman, The Evolving Face of Personal Selling. Application of AIDA Model in Personal Selling.

UNIT-2:
Process of Personal Selling, Prospecting, Pre-approach, Approach, Presentation and Demonstration, Handling the objections, Closing the Sales, Post - Sale Activities, Qualities of a Successful Sales person with reference to B-2-B, B-2-C Marketing, tools for personal selling, Sales Aids – Use of technology in sales effective selling techniques, Tele Marketing.

UNIT-3:
Concept of Forecasting, Sales Forecasting methods, Quantitative and Qualitative methods, Sales Budget, Sales Quotas, Sales Territories, Sales Controlling and Sales Cost Analysis

UNIT-4:
Managing the Sales Force, Procedures and criteria extensively used as selection tools for recruiting and testing sales ability, Sales Force Job Analysis and Description, Training and Development, Compensation and Innovation, Motivating the Sales Team: Motivation Programs - Sales Meetings, Sales Contests, Sales Compensating (Monetary compensation, incentive programs as motivators, Non-Monetary compensation – fine tuning of compensation package, Performance Appraisal of Sales Personnel.

UNIT-5:
Distribution concept and definition, steps in distribution, Changing role of Distribution in current context, Distribution function, distribution audit, related functions Physical distribution system, logistics, management, distribution as link between Sourcing and Marketing, Distribution as Service function its needs and levels, standard costs and control of key activities, designing a Distribution system Warehousing – Why? Types and functions, Distribution Requirement Planning (DRP), Concept of Inventory Management Distribution Management. Distribution Resource Planning.

Text Books:

1. Sales Management; Richard Rstill, Edward W. Cundiff
2. Rosann L. Spiro, William J. Stanton, Gregory A. Rich; 11th ed., Management of a Sales Force, Tata McGraw Hill, New Delhi 2008
3. Krishna K Havaldar & Vasant M Cavale, Sales and Distribution Management: Text and Cases, McGrawHill Education, Eighth Edition

Reference Books:

1. Tapan K. Panda & Sunil Sahadev, *Sales and Distribution Management, 2/e,* 2011, Oxford University Press

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Course Title: **Service Marketing** ***(Elective-1)***			Course Code: **GAD670**
Credit: 3	L **3**	T **0**	P **0**
Year: **2nd**			Semester: **III/ IV**

UNIT-1:
Introduction to Services Marketing – Trends & Opportunities, The Service Sector & Service Characteristics, Classifying Services & The Services Marketing Mix, Customer Behavior in Service Settings, Concept of service marketing triangle, Service marketing mix.

UNIT-2:
Consumer behaviour in services: Search, Experience and Credence property, Customer expectation of services, Two levels of expectation, Zone of tolerance, Factors influencing customer expectation of services, Customer perception of services - Factors that influence customer perception of service, Service encounters.

UNIT-3:
Expectations and Service Quality, A Gaps Approach to Quality Management: SERVQUAL, Customer satisfaction, Strategies for influencing customer perception, Service Failure and Recovery

UNIT-4:
Employee role in service designing: Importance of service employee, Source of conflict, Quality – productivity trade off. Strategies for closing GAP 3, Importance of customer & customers role in service delivery, Strategies for enhancing - Customer participation, Delivery through intermediaries - Key intermediaries for service delivery, Intermediary control strategies

UNIT-5:
Physical evidence in services: Types of services capes, Role of services capes, Frame work for understand services capes & its effect on behaviour, Guidance for physical evidence strategies. Role of price and value in provider GAP 4, Role of nonmonetary cost, Price as an indicator of service quality Approaches to pricing services, pricing strategies.

Text Books:

1. Valarie Zeithaml, Mary Jo Bitner, Dwayne Gremler, Ajay Pandit, **Services Marketing: Integrating Customer Focus across the Firm,** McGraw-Hill Education
2. Rajendra Nargundkar, **Services Marketing**, McGraw-Hill Education
3. K, Rama Mohan Roa, **Service Marketing, 2/e,** Pearson Education**.**
4. Harsh Verma, **Service Marketing: Text & Cases**, Pearson Education, 2nd Edition.

Reference Books

1. Audrey Gilmore, **Services Marketing and Management**, SAGE, 2003
2. Steve Baron, Kim Cassidy, Kim Harris and Toni Hilton, **Services Marketing: Text & Cases**, Palgrave Macmillan, 2009

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Course Title: **Cost and Management Accounting** ***(Elective-2)***	Course Code: **GAC6410**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III / IV**

UNIT-1:
Introduction to Management Accounting: Nature and scope of cost and management accounting, Management Accounting and managerial decisions, Role of management accountant and responsibilities.

UNIT-2:
Responsibility Accounting: Meaning and significance of responsibility accounting, Responsibility centers, cost centers and Investment centers, Methods of transfer prices, Advantages of Responsibility Accounting, problems and solutions.

UNIT-3:
Budgeting: Definition, Types, Fixed and flexible budget, cash budget, concept of zero base budgeting.

UNIT-4:
Standard costing and variance analysis: Standard costing as a technique of cost control, variance analysis, Material, labour and variable overhead variance analysis.

UNIT-5:
Marginal costing and Break-Even analysis: Concept of marginal costing and absorption costing and direct costing. Cost volume profit analysis. Break – Even analysis and its applications in business decisions, concept of margin of safety, Decisions regarding sales mix. Make or buy, discontinuation of product line and acceptance of an offer of supply, Meaning and Importance, methods of capital budgeting evaluation, discounted cash flow method, Net present value method and rate of return method.

Text Books

1. Principles of Management Accounting - Manmohan and Goyal
2. Management Accounting principles and practice - R.K.Sharma and S.K. Gupta
3. Management Accounting and Financial control - R.L. Gupta
4. Management Accounting - I.M. Pandey
5. Management Account - Robert Anthony
6. Pillai & Bhagwati, Cost Accounting, S.chand Publication,
7. C.A. Bhavesh & N. Chandarana, Cost Accounting and Financial Management, 2nd Edition, Taxmann's, New Delhi, 2013.
8. Ravi M. Kishore, Cost Accounting and Financial Management, 7th Eidtion, Taxmann's New Delhi.
9. Ravi M. Kishore, Cost Management, 4th Edition, Taxmann's, New Delhi, 2013.

Reference Books:

1. C. Vasanta Madhavi, Business In Crisis, Book man India, Taxmann's New Delhi, 2010.
2. Khan & Jain, Cost Accounting, 2nd Edition, Tata McGraw Hill, New Delhi, 2003.
3. Alok Agarwal & Mridu Agarwal, A comprehensive approach to cost accounting, 3rd Edition, Lawpoint Publication, Kolkata, 2013.
4. S.P. Jain & K.L. Narang, Cost and Management accounting, 12th Edition, Kalyani Publishers, Ludhiana, 2012.

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Course Title: **Financial Derivatives** *(Elective-2)*	Course Code: **GAD6420**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III / IV**

Unit-1: Options Markets: Introduction: Options Trading / American and European Options / Adjustments in Option Contract Terms / The Options Clearing Corporation /Index Options / Futures Options / Foreign Currency Options / Interest Rate Options, Values of Options at Expiration, Option Strategies, The Put-Call Parity Relationship, Callable Bonds / Convertible Securities / Warrants / Collateralized Loans / Levered Equity and Risky Debt.

Unit -2: Option Valuation: Intrinsic and Time Values / Determinants of Option Values, Restrictions on Option Values, Binomial Option Pricing**,** Black-Scholes Option Valuation, Hedge Ratios and the Black-Scholes Formula / Portfolio Insurance / Hedging Bets on Mispriced Options.

Unit -3: Futures Markets: The Basics of Futures Contracts / Existing Contracts, The Clearinghouse and Open Interest / The Margin Account and Marking to Market / Cash versus Actual Delivery / Regulations / Taxation, Hedging and Speculation / Basis Risk and Hedging, The Spot-Futures Parity Theorem / Spreads / Forward versus Futures Pricing, Expectation Hypothesis / Normal Backwardation / Contango / Modern Portfolio Theory.

Unit -4: Types of Futures and Swaps: Foreign Exchange Futures **(**The Markets / Interest Rate Parity / Direct versus Indirect Quotes / Using Futures to Manage Exchange Rate Risk)**,** Stock-Index Futures **(**The Contracts / Creating Synthetic Stock Positions: An Asset Allocation Tool / Index Arbitrage / Using Index Futures to Hedge Market Risk)**,** Interest Rate Futures, Swaps.

Unit-5: Options as Hedging Tools and other Derivatives: Delta hedging, delta covered positions, gamma and trading volatility, kappa and the costs of miss-estimating volatility, theta and time value, rho,Credit Derivatives, Exotic Options, Weather, Energy and Insurance Derivatives, Asian Options / Barrier Options / Look back Options / Currency-Translated Options / Digital Options.

Text Books:

1. Investments, Sixth Edition, by Zovi Bodie, Alex Kane, and Alan J. Marcus- McGraw Hill Publisher
2. Investment Science (First edition) by David G. Luenberger, Oxford Press
3. Options, Futures, & Other Derivatives and Deriva Gem CD Package (8th Edition) by John C. Hull (Author)
4. Philleppe Hunt & Joanne Kennedy, Financial Derivatives in Theory and Practice, 8th, Wiley, England, 2004
5. Steven Shreve, Stochastic Calculus for Finance I: The Binomial Asset Pricing Model (Springer Finance / Springer Finance Textbooks), Springer, 2004

Reference Books:

1. Steven Shreve, Stochastic Calculus for Finance II: Continuous-Time Models (Springer Finance), Springer, 2008

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Course Title: **Financial Markets and Institutions** *(Elective-2)*	Course Code: **GAC6430**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III / IV**

Unit-1: **Financial Market: An Introduction:** Meaning, Nature and Role of Financial System; Financial Markets as a component of Financial System; Financial system and Economic Growth; Financial System Designs: Bank - based and Market-based.

Unit-2: **Non Banking Financial Institutions and Statutory Financial Organization:** Small Savings, provident funds and pension funds, Insurance companies, Unit trust of Indian and mutual funds, miscellaneous non banking financial intermediaries, public Deposits with non banking companies, an overview of non banking statutory financial Organizations i.e. IFCI, NIDC, ICICI, IDBI, EXIM bank, TFCI etc.

Unit-3: **Money Market:** Meaning, Characteristics and Functions of Money Market; Role of the Reserve Bank in the Money Market; Intermediaries in the Money Market; Development of Money Market in India; Money Market Instruments: Treasury Bills, Commercial Paper; Certificate of Deposit; Commercial Bills; Collateralized Borrowing and Lending Obligation; Call Money Market and Term Money Market.

Unit-4 : Capital Market: Meaning, Functions and Types of Capital Market; Reforms in the Capital market; Intermediaries; Issue Mechanisms; Types of Primary Issues: Public, Rights and Private Placement; Resource Mobilization from International Capital Markets: ADRs, GDRs and ECBs; Primary Market Scenario in India; Debt Market: Private Corporate. Role of SEBI in the Capital Market.

Unit-5: **Secondary Capital Market:** Functions of the Secondary Market; Post Reforms Stock Market Scenario; Organization, Management and MeMBTership of Stock Exchanges; Listing of Securities; Trading Arrangements; Stock Market Index; Stock Exchanges in India.

Text Books:

1. M.Y.Khan, "Indian Financial System", Mc Graw Hill, 6th Edition.
2. Machiraju, H.R., "Indian Financial System", Economic Times.
3. Bhole, LM and Mahakud, J., "Financial institutions and markets" Mc Graw Hill, 5th Edition.
4. Bharti V. Pathak, The Indian Financial System-Markets, Institutions and Services, 3rd Edition, Pearson Education, Noida, 2011.
5. Fabozzi , Frank J, Modigliani & Franco, Capital Market- Institutions & Instruments,4th Edition, PHI Learning, Delhi,
6. G. Ramesh Babu, Management of financial institutions in India, Concept Publishing Company, New Delhi, 2007.

Reference Books:

1. Anthony Saunders, Financial Institutions Management- A Risk Management Approach, 7th Edition, McGraw Hill Education, 2011.
2. Siddhartha Shankar Saha, Indian Financial System and Markets, 1st Edition, McGraw Hill Education, New Delhi, 2012.
3. Benton E. Gup, Banking and Financial Institution: A guide for Directors, Investors and Borrowers, Wiley Finance, 2011.

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Course Title: **International Financial Management** *(Elective-2)*	Course Code: **GAD6440**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III / IV**

Unit-1: Global Financial Environment: Fundamentals of International Financial Management, Direct and Indirect Quotes, The challenge of International Finance, Recent changes in Global financial markets, Interest rates in global money markets, international monetary system, International Monetary Fund, Special Drawing Rights (SDR's), Rise of Multinational Corporation, Determination of Exchange Rate.

Unit-2: Foreign Exchange Market and Theories: Organization and structure of forex market, spot market, forward market, mechanics of currency trading, exchange rate quotations and arbitrage, foreign exchange market in India, Arbitrage and law of one price, Purchasing Power Parity (PPP), The Fisher Effect, The International Fisher Effect, Interest Rate Parity Theory, Relationship between Forward Rate and Future Spot Rate, Currency Forecasting.

Unit-3: Currency Derivatives and Financial Management: Currency futures contract, using currency futures, Exchange traded currency futures, Currency Options, Valuation of option, Defining exposure and risk, measuring exposure and risk, Risk management process, Objectives of hedging policy, Managing transactions and operating exposure, , International Cash Management, Accounts Receivable Management, Inventory Management, Short–Term Financing.

Unit-4: Cost of Capital and Capital Budgeting for MNC's: The Cost of Equity Capital, The Weighted Average Cost of Capital for Foreign Projects, Discount Rates for Foreign Investments, The Cost of Debt Capital, Establishing a Worldwide Capital Structure, Valuing Low–Cost Financing Opportunities, Issues in Foreign Investment Analysis, Foreign Project Appraisal: The Case of International Diesel Corporation, Political Risk Analysis, Growth Options and Project Evaluation.

Unit-5: Currency, Swaps, Futures and Options: Major types of Swap structures, Motivations Underlying Swaps, Evolution of Swap Markets, Application of Swaps, Valuation of Swaps**,** Forward Rate Agreements (FRA's), Interest Rate Futures, Interest Rate Options, Demonstration Problems.

Text books:

1. International Finance : A Business Perspective 2nd Edition, Prakash G Apte
2. Multinational Financial Management 0009 Edition, Alan C. Shapiro
3. Pathak, THE INDIAN FINANCIAL SYSTEM, 3rd, Dorling Kindersley India Pvt Ltd., India, 2011
4. Apte, International Financial Management, 6th, McGraw Hill Education, India, 2013

Reference books:

1. RBI, SatyanandSahoo, Financial Structures and Economic Development in India: An Empirical Evaluation, Press Release, 2013
2. IlaPatnaik, Ajay Shah, Reforming India's Financial System, Press Release, 2014

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Course Title: **Risk Management and Insurance** ***(Elective-2)***	Course Code: **GAD6450**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III / IV**

Unit-1: Introduction to Risk: Risk and Uncertainty, Classification of risks, Risk, peril and hazard, Cost of Risk, Methods of Handling Risk. Risk Management, Nature, Development, Scope, Definition, Objectives. Personal v/s Corporate Risk Management, Corporate Risk Objectives, Risk Management Process.

Unit-2: Risk Identification: Internal and External Risk Exposures and Operative Causes. Risk Evaluation. Statistical concepts involved. Probability Theory and Probability distribution. Measures of Central tendency and dispersion Graphical presentation of Data.

Unit-3: Risk Evaluation: Assessing probability and severity factors. Application of statistical Concepts. Probable Maximum Loss; Ver. Risk Control. Loss Prevention, Loss, Prevention, Loss Minimization, Diversification, Optimal Loss control, Contingency Planning.

Unit-4: Introduction to Insurance: Insurance as a Risk Management Technique: Principle of Indemnity, Insurable Interest, subrogation, utmost good faith, Requisites of insurable Risks, Characteristics of Insurance contract, Functions of Insurers: Types of Insurers, Reinsurance: the concept, uses and advantages. Marketing channels: Agents & brokers Professionalism, remuneration, responsibilities, classification, criteria for appointment and capital adequacy norms for broker, an overview of IRDA.

Unit-5: Life Insurance and General Insurance: The concept of Life Insurance, types of Life, Insurance contracts, Tax treatment of Life Insurance. Life Insurance Products- Term, Insurance, Whole Life Insurance, Universal Life Insurance, Variable Life Insurance, Adjustable Life Insurance, Endowment Life Insurance, Participating & Nonparticipation Life Insurance. The Actuarial Science: The concept and the responsibilities of an actuary, Provisions of Life Insurance contracts: Settlement Options, Non-forfeiture Options, Dividend, Optional Provisions and Universal Life Policy Provisions, Special Life, Insurance forms: Characteristics, uses, advantages & disadvantages.

Text Books & Reference Books

1. Management of Banking & Financial Services, Padmalatha Suresh & Justin Paul, Pearson, 2nd Edition.
2. Bank Management & Financial Services, Peter.S.Rose & Sylvia. C. Hudgins, Tata McGraw Hill 2010, 7th Edition.
3. Managing Banking Risk, Hennie Van Greuning, Sonja Brajovic Bratanovic, Jaico Publishing House 2008
4. Banks & Institutional Management, Vasant Desai, Himalaya Publishing House 2010, 2nd Edition.
5. Fundamentals of Risk & Insurance, Emmett J. Vaughan & Therese M. Vaughan, Wiley, India Edition 2003, 9th Edition.
6. Risk Management & Insurance, James S. Trieschmann, Robert E. Hoyt & David. W. Sommer, Cengage Learning 2005, 12th Edition.
7. Indian Insurance – A Profile, H. Narayanan, Jaico Publishing House, 2008
8. Risk Management & Insurance, Perspectives in a Global Economy, Harold. D. Skip &W.Jean Kwon, Blackwell Publishing 2008
9. Risk Management & Insurance, S. Aruna Jatesan, T.R. Viswanathan, MacMillan 2009
10. Introduction to Risk Management & Insurance, Mark. S.Dorfman, Prentice-Hall of India Private Limited-2007, 8th Edition.

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Course Title: **Security Analysis and Portfolio Management** *(Elective-2)*	Course Code: **GAC6460**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III / IV**

Unit-1: Introduction: Real Assets Vs Financial Assets, Primary Vs Secondary Markets, Separation of Ownership and Management, Various sectors of Financial System, I-Banking, Globalization, Securitization, Financial Engineering, Overview of Trade Exchanges, Types of Orders, Globalization of Stock markets and insider trading, Domestic Macro Analysis for Investment and Corporate Finance (Wiley Finance) 2nd edition economy, Demand and Supply Shocks, Fiscal and Monetary policy, Economic Indicators, Industry Analysis.

Unit-2: Money Market: Types of money market instruments, LIBOR Market, Types of bonds, Mortgage Backed Securities, Types of stock and their characteristics, Dow Jones, S&P 500, BSE and NSE Index, Bond Market Indicators, Types of Mutual Funds (Open and closed end funds), Real Estate Investment Trust (REIT), Types of Funds, Front End Load, Back End Load.

Unit-3: Security Analysis: Fundamental Analysis, Dividend Discount Models or Gordon's Method, Free Cash Flow Valuation Method, P/E Ratio and Growth Opportunities, Technical Analysis, Random Walk Hypothesis, Efficient Market Hypothesis.

Unit-4: Fixed Income Securities: Bond Characteristics, Prices and Yields, Types of Bonds (Convertible, Corporate, Callable, Puttable, Floating Rate)Bonds, Convexity and Duration of bonds, Bond Pricing between Coupon dates, Bond Prices when held till maturity, Zero Coupon Bonds, Tax effects on bonds, Bond Indentures, Sinking Fund.

Unit-5: Portfolio Management: Harry Markowitz's Theory of Portfolio Management, Risk management and a portfolio investment strategy, Determination of expected risk and return of portfolio, Utility Function and Risk Aversion, Mean Variance Analysis, Portfolio Performance Evaluation, Sharpe Ratio Analysis, CAPM (Capital Asset Pricing Model) Analysis: Capital Allocation Line, Determination of optimal portfolio, Arbitrage Pricing Theory.

Text Books:

1. Investments, Sixth Edition, by Zovi Bodie, Alex Kane, and Alan J. Marcus- McGraw Hill Publisher
2. Corporate Finance by Ross, Westerfield, Jafee 10th Edition, Mc Graw Hill Publisher
3. Damodaran on Valuation, Security
4. Security Analysis And Portfolio Management by S. Kevin –PHI Learning P. Ltd. (Prentice Hall India)
5. Bodie, Kane, Marcus, Investments, 8th , McGraw Hill, New York, 2014
6. Alexander, Sharpe and Bailey, Fundamentals of Investment, 3rd, Prentice Hall, New Jersey, 2013

Reference Books:

1. David G. Luenberger, Investment Science, 2nd , Oxford University Press, Oxford, 2014.
2. John C. Hull; Options, Futures, and Other Derivatives and DerivaGem CD Package, 8th, Prentice Hall, New Jersey, 2011

Department of MBA
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Course Title: **Tax Planning and Management** ***(Elective-2)***	Course Code: **GAD6470**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III / IV**

Unit-1: **Introduction to Tax Management:** Concept of Tax Planning: Tax avoidance and Tax Evasion Corporate Taxation.

Unit-2: Tax Planning for New Business: Tax planning with reference to location, nature and Form of organization of new business

Unit-3: Tax Planning and Managerial Decisions: Tax planning in respect of own or lease, sale of assets used for scientific research, make or buy decisions: Repairs, Replace renewal or renovation, and shutdown or continue decisions.

Unit-4: Special Tax Provisions: Tax provisions relating to free trade zones, infrastructure Sector and backward areas: Tax incentives for exporters

Unit-5: Tax Payment: Tax deduction and collection at source; Advance payment of tax.

Text Books & Reference Books

1. Corporate Tax Planning and Management – S.C.Mehrotra and Dr.S.P.Goyal, Sahitya
2. Bhavan Publications, Agra.
3. Corporate Tax planning – Monika Duggal, R.B.S.A. Publication, 340, Chaura Rasta, Jaipur
4. Corporate Tax Planning Handbook – R.N. Lakhotiya and Subhash Lakhotiya, Vision
5. Books Pvt. Ltd., 24 Feroz Gandhi Road, Lajpath Nagar, III New Delhi – 110 024 India.
6. Direct Taxes: Law and Practice – Singhania V.K., Taxman's Publication, New Delhi.
7. Direct Tax Planning and Management – Vinod K. Singhania, Taxman's Publication, New Delhi.
8. Dr. V.K. Singhania & Dr. K Singhania, Direct taxes law & practice, 51 Edition, Taxmann's , New Delhi, 2014-15.
9. Kaushal Kumar Agarwal, Corporate Tax Planning, 6th Edition, Atlantic Publishers, New Delhi, 2006.
10. Subhash Lakhtokia, How to save Income Tax through tax planning, 28th Edition, Vision Books, 2013.
11. Kaushal Kumar Agarwal, Direct Tax Planning & Management,5th Edition , Atlantic Publishers, 2007.
12. Dr Girish Ahuja & Dr. Ravi Gupta, Simplified Approach to Corporate Tax Planning,14th Edition, Bharat Law House, New Delhi, 2013-14.

Department of MBA
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Course Title: **Acquisition and Talent Management** ***(Elective-3)***	Course Code: **GAC6210**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III / IV**

Unit 1: Talent Acquisition: Concept, Differentiate sourcing from selection, Acquisition work Flow, Job analysis, Person Job Fit and Person Organization Fit, Selection Methods, Legal Compliance , Halo Effect and Recency Effect, Interview, Interview Question design Candidate Evaluation, On-boarding , On-boarding Ideas

Unit 2: Basics of Talent Management - Talent:- engine of new economy, difference between talents and knowledge workers, leveraging talent, the talent value chain, elements of talent friendly organizations, talent management process.

Unit 3: Talent Management System - Components and benefits of Talent Management System; creating TMS, challenges of TMS; building blocks of talents management: competencies - performance management, evaluating employee potential

Unit 4: Talent Planning - Concept, succession management process; cross functional capabilities and fusion of talents; talent development budget, contingency plan for talent; building a reservoir of talent, compensation management within the context of talent management

Unit 5: Developing and Retaining Talent - Potential identification and development, employee retention- motivation and engagement, engaging talent through coaching and mentoring, Return on talent; developing talent management information system**.**

Text Books:

1. The Talent management hand Book, Lance A Berger & Dorothy R Berger, TMH
2. Chowdhary, Subir, The Talent Era, Pearson Education, New Delhi
3. Chowdhary, Subir, Management 21C, Financial Times/Prentice Hall International
4. Capelli Peter (2008). Talent on Demand: Managing Talent in Age of Uncertainty. Harvard Business Press.
5. Allan Schweyer (2004). Talent Management Systems: Best practices in Technology Solutions for Recruitment, Retention
6. Kavin Oaks & Pat Galagan,The Executive Guide to Talent Management, First Edition, ASTD, USA, 2011

Reference Books:

1. Lance A. Berger & Dorothy R. Berger,The Talent Management handbook, second edition, Tata McGraw-Hill, New Delhi,, 2011
2. Marshell Goldsmith & Louis Carter,Best Practices in Talent Management, First Edition, Wiley Publishers, San Francisco.
3. T.V Rao, Hurconomics for Talent Management, First Edition, Pearson, New Delhi, 2011.
4. Kaye Thorne & Andy Pellant, Guide to Managing Talent, First Edition, Page Publications, 2007.

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Course Title: **Compensation Management** ***(Elective-3)***	Course Code: **GAD6220**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III / IV**

Unit 1: Introduction to Compensation – Compensation, dimensions, Conceptual Framework and components of Compensation programme , Wage vs. Salary; Fringe benefits, Salary Structure, Components, Time rate system, Piece rate System, Wage and salary administration, Payroll Administration.

Unit 2: Wages Theories and Wage Determination - Theories of wages: Economic theories, Marginal Productivity theory, Bargaining theory, Equity theory, Tournament Theory, Agency Theory;

Unit 3: Job Evaluation: Concept, Scope, Methods and techniques, Wage Survey, Wage Policy in India, Process of wage determination in India, Criteria for wage fixation, wage differentials.

Unit 4: Legal Framework of Compensation Administration – Definition of wages under various Legislations, The Minimum Wages Act 1948, The Payment of Wages Act 1936, The Payment of Bonus Act 1965, The Equal Remuneration Act1976, Machinery for Wage settlement - Wage Boards, Legislations, The Pay Commission, and Collective bargaining.

Unit 5: Executive Compensation – Components, Contingent pay: Pay for performance; Knowledge based pay system & market based pay system, Incentive based pay systems and types of incentive plans, Profit Sharing and Stock Options, Compensation management and impact on job satisfaction, motivation and productivity.

Text Books:

1. Milkvich & Newman: Compensation – TMH
2. Barry Gerhart, Sara L Rynes, Compensation, Sage
3. Sinha P.R.N., Wage Determination in India
4. Martocchio – Strategy Compensation, Pearson.
5. Bergess, Lenard R. – Wage & Salary Administration, London, Charles Evami,
6. Micton , Rock . Hand Book of Wage & Salary Administration, Helen.
7. K.N. Subramarniam, Wages in India
8. Pramod Verma –Labour Economics and Industrial Relations
9. Mousumi S. Bhattarcharya & Nilanjan Sengupta, Compensation Management, 1st Edition, Excel Books, 2009, New Delhi.
10. Richard I. Henderson, Compensation Managament in a knowledge based world, 10th Edition, Pearson Education, 2009, New Delhi.

Reference Books:

1. Mousumi S. Bhattarcharya & Nilanjan Sengupta, Compensation Management, First Edition, Excel Books, 2009, New Delhi.
2. Richard I. Henderson, Compensation Managament in a knowledge based world,Tenth Edition, Pearson Education, 2009, New Delhi.

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Course Title: **Counseling Skills for Managers** ***(Elective-3)***	Course Code: **GAD6230**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III / IV**

Unit-1: **Introduction-** Meaning, Functions and Type of Counseling, Goals of Counseling, Emergence and Growth of Counseling Services; Approaches to counseling; Counseling Skills, Helping Relationships - Counseling Interviews, Communication Styles- Empathy and Holistic Listening - Accurate Responding and Effective Feedback.

Unit 2: **Counselling process-** Beginning, Developing and terminating a counselling relationship and follow up., The Counselling Environment, Intake, Referral procedures, Guidelines for effective counselling.

Unit-3: **Counselling Interventions**- Performance Counselling- Problem Performers –Problem Situations, Alcoholism, Absenteeism, Conflicts - Stress and Spill over –Employee Assistance and Personnel Counselling – Organizational framework.

Unit-4: **Counsellor's Attitude and Skills of Counselling** – Client Relationship, Understanding Client's Behavior. Assessing Clients problems. Counselling Therapies- Insight Oriented Therapy. Behavior Therapy. Handling Situations of Strikes, Disputes Through Counselling.

Unit-5: **Special problems in counselling-** Need of Counseling Cell in the Organization. Application of Counseling to Organizational situations., Downsizing, Mentoring and Team Management / Conflict Resolution. Psychotherapy & Employee Counseling:

Text Books:

1. S Narayan Rao, Counseling& guidance, Tata Mcgraw Hill, New Delhi.
2. Jeffrey A Kotter, Counseling theories and practices, Cengage Publishing, New Delhi.
3. Robert C Carson, Abnormal psychology, Tata Mcgraw Hill, New Delhi.
4. Kavita Singh, **Counselling skills for managers**, 1st Edition, Prentice Hall, 2007.
5. S Narayan Rao and T.S. Sahajpal, **Counseling and guidance**, 3rd Edition, Tata Mcgraw Hill, New Delhi

Reference Books:

1. Jeffrey A Kotter and David.S. Sephard, **Counseling theories and practices**, 1st Edition, Wadsworth publishing company.
2. Michael Reddy, **The manager's guide to counseling at work**, 1st Edition, Wiley Publication.
3. Michael Carrol, **Workplace Counselling**, 1st Edition,. Sage Publications.

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Course Title: **Industrial Relations** ***(Elective-3)***			Course Code: **GAC6240**
Credit: 3	L **3**	T **0**	P **0**
Year: **2nd**			Semester: **III / IV**

Unit-1: **Industrial Relations**- Definition - Scope - Functions - Industrial relations in post-independence period - Indian Code of Industrial Relations - Three actors and their roles in IR: Approaches to IR-HR Relations approach-Gandhian approach-Marxian approach and Dunlop's Systems approach. Standing Orders.

Unit-2: **Trade Union**- Function of Trade Union, Types & structure of Trade Union, Theories on Trade Unionism, Selling Pearl man, Sidney and Beatrice Webb, Karl Marx, Robert Hoxie and Mahatma Gandhi, White Collar Trade Unions, Trade Union Movement in India. Employers' Federation.

Unit-3: **Industrial Relation Machinery to solve Industrial Dispute**- Negotiation, Mediator. Arbitration- Work Committees, Conciliation, Board of Conciliation, Court of enquiry, Labour Court, Industrial Tribunal, National Tribunal, Role of Judiciary & its impacton industrial relation.

Unit-4: **Collective Bargaining**- Definition Structure, Scope, - Role of Government in collective bargaining, Worker participation in management, Definition, Nature, Objectives – Functions, Works Committee, Joint management, Councils Shop councils, Joint councils, Indian conditions in collective bargaining,.

Unit-5: **Industrial Unrest**- Co-operation and conflict, implications of industrial unrest - Employees dissatisfaction - Workers complaints and grievances - Disciplinary action - Domestic enquiry - Strikes - Lock - outs - Prevention of strikes and lockouts - Settlement of dispute. Role of Human Resource Development in Developing Industrial Relation- Industrial Relation Democracy, Industrial peace.

Text books:

1. Industrial Relations – Monappa, NaMBTudini & Selvaraj
2. Industrial Relations- Dwivedi R.S.:
3. Industrial Relations in India and Workers involvement in Management- Michael, V.
4. Arun Monappa, Ranjeet Nambudiri & Patturaja Selevraj, Industrial Relations & labour Laws,Tata McGraw-Hill,Second Edition, 2012, New Delhi.

Reference Books:

1. Sivarethinamohan, Industrial Relations and labour Welfare, PHI, 2010, New Delhi
2. P.R.N. Sinha, Indu Bala Sinha, Seema Priyadarshani Shekhar, 4th Edition, 2009, Pearson Education (Dorling kenderslay (India) Pvt Ltd),New Delhi, 2009.

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Course Title: **Labour Laws** ***(Elective-3)***		Course Code: **GAD6250**
Credit: 3	L **3**	T **0**	P **0**
Year: **2nd**		Semester: **III / IV**

Unit-1: **Introduction**- Concept Functions Delimitation of the object of labour law Voluntariness, working for someone else, subordination and wage payment Exclusions, Inclusions: special labour relations.

Unit-2: **Industrial Disputes Act, 1947**: Definition, Authorities for the settlement of disputes, methods of settlement, collective bargaining, conciliation, arbitration and adjudication, strikes and lockouts, lay off and retrenchment, change of service conditions. Industrial Employment standing orders) Act, 1946 : Certificate, applicability, interpretation, appeal, disciplinary actions and grievance procedure. Industrial Relations Act, 1960

Unit-3: **Law Relating to Industrial Relations**. Trade Union Act, 1926 : History and analysis of trade union movements in India, registration, status function, immunities and liabilities of trade union, recognition of union. Factory Act 1948 The employer's liability Act 1938 The sales Promotion employees (Conditions of Service) Act, 1976.

Unit-4: **The Minimum Wages Act, 1948-** Fixing of Minimum Rates of Wages –Minimum Rates of Wages –Procedure for Fixing and Revising Minimum Wages – Advisory Boards and Committees – Wages in Kind –Wages for worker who works for less than normal working day – Wages for two or more classes of work – Minimum time rate wages for piece rate work – Maintenance of Registers and Records.

Unit-5: **Law Relating to Social Security & Safely Measures-** Workmen's Compensation Act, 1923 Employees provident fund and miscellaneous provisions Act, 1952. Maternity Benefit Act, 1961. Fatal Accident Act 185**7** The Payment of Gratuity Act, 1972.

Text books:

1. Industrial Law – P L Malik
2. Industrial Law – J K Bareja
3. Labour Laws for managers – B D Singh
4. Industrial & Labour Laws – S P Jain
5. P.K Padhi, Labour & Industrial Laws, Second Edition, PHI, 2012, New Delhi.
6. H.L Kumar, Labour Laws-Everybody Should Know, 6th Edition, Universal Law Publishing, 2011, New Delhi.

Reference Books:

1. Arun Monappa, Ranjeet Nambudiri & Patturaja Selevraj, Industrial Relations & labour Laws,Tata McGraw-Hill,Second Edition, 2012, New Delhi.
2. S.C Shrivasta, Industrial Relations and Labour laws, Fifth Edition, Vikas Publishing House, 2009, Mumbai

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Course Title: **Organizational Development and Change Management** *(Elective-3)*	Course Code: **GAD6260**
Credit: 3	L: **3** T: **0** P: **0**
Year: **2nd**	Semester: **III / IV**

Unit-1:
Introduction to Organizational Development
Organisational Development: Definition, need, assumptions, historical development, issues, and future of OD: Models and theories and planned change. Process of OD, issues in consultant- client relationship.

Unit-2:
Organizational Interventions
OD Interventions: Planning interventions; Human Resource Management intervention, Team interventions; Human process interventions, Techno-structural interventions. Inter- group and Third party peacemaking interventions, Comprehensive interventions, Structural interventions, personal interventions, Future of OD, Research on OD.

Unit-3:
Organizational Change
Organizational Change- Meaning- Necessity for Change; Classification of Change; Levers of Organization Change; Models of Organizational Change- Kurt Lewin Three Stage Model and Force Field Analysis, Systems theory, Stream Analysis.

Unit-4:
Bringing Change- Change Agent
Change Agent-Types and Effectiveness; Leadership and HR Role; Organization's Readiness for Change; Recipients of Change- From eager Acceptance to Resistance; Minimizing the Resistance; Psychological Contract.

Unit-5:
Coping with Change
Measuring Change: Designing Effective Control Systems; DICE Model, Organization Identity and Change; Incremental Change Vs Disruptive Change, Organization Structures, Systems and Change.

Text Books:

1. Thomas G. Cummings and Christopher G. Worley, **Organization Development and Change**, 10th Edition, Cengage Learning, 2009.
2. Rolf. P. Lynton and Uday Pareek, **Training for Development,** 3rd Edition**,** Sage Publication, New Delhi.
3. V. Nilakant and S. Ramnaraya, **Change Management: Altering Mindsets in A Global Context,** Sage, 2006.

Reference Books:

1. Gary N. Mclean, **Organization Developmen**t, 1st Edition, Berrett Koehler Publication, 2006**.**
2. Raymond.A.Noe and Colin Winker, Employee **Training and Development**, 1st Edition, McGraw Hill.
3. **HBRs must read on Change**, Harvard Business Review Press, WS Retail (seller).

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Course Title: **Organizational Structure and Change** *(Elective-3)*	Course Code: **GAC6270**
Credit: 3	L: **3** T: **0** P: **0**
Year: **2nd**	Semester: **III / IV**

Unit-1: Concepts of Management and Organization; Organization Structures-Meaning and Importance; Organization Designs and Dimensions; Types of Organizational Structure, Principles of Organization- Parity Principle, Fayol's Guidelines, Unity of Command, Chan of Command, Span of Control, Organization Life Cycles.

Unit-2: Structural Interventions – Industry-Structure Relationship; Organization Design Framework and Environment; Technology Interventions; Strategic Interventions; Organization Culture; Organization Size; Comparison and Choice of Structures, Features of International Organizations, Developments in Organization Structure.

Unit-3: Organizational Change- Meaning- Necessity for Change; Classification of Change; Levers of Organization Change; Models of Organizational Change- Kurt Lewin Three Stage Model and Force Field Analysis, Systems theory, Stream Analysis.

Unit-4: Change Agent-Types and Effectiveness; Leadership and HR Role; Organization's Readiness for Change; Recipients of Change- From eager Acceptance to Resistance; Minimizing the Resistance; Psychological Contract.

Unit-5: Coping with Change; Measuring Change: Designing Effective Control Systems; DICE Model, Organization Identity and Change; Incremental Change Vs Disruptive Change, Organization Structures, Systems and Change.

Text Books:

1. Managing Organizational Change, Palmer Dunford Avin, TMH
2. Management of Organization Changes, K. Harigopal, Response Book
3. Principles of Management-Koontz
4. Organisational structure change and management, Bhattacharya, HPH
5. Change Management: Financial Times Briefing by Richard Newton, Paperback
6. Change Management: Altering Mindsets in A Global Context, V Nilakant and S Ramnarayan, Paperback
7. Stehen P. Robbins and Mary Mathew, Organization Theory-Structure Design and Applications, 3rd Edition, Mathew, Pearson.
8. V. Nilakant and S. Ramnaraya, Change Management: Altering Mindsets in A Global Context, Sage, 2006.

Reference Books:

1. Palmer Dunford Avin, **Managing Organizational Change**, 1st Edition, Tata McGraw Hill.
2. K. Harigopal, **Management of Organization Changes,** Response Book, New Delhi.
3. **HBRs must read on Change**, Harvard Business Review Press, WS Retail (seller).
4. Jay R. Galbraith., Diane Downey and Amy Kates, **Designing Organizations: An Executive Guide to Strategy, Structure**, 1st Edition, AMACOM, New York .

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Course Title: **Performance Management** *(Elective-3)*	Course Code: **GAD6280**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III / IV**

Unit-1: Performance Management (PM) Conceptual Frame Work- Introduction to Performance Management, nature, scope, importance, process of Performance Management, Job role and competency analysis, Goal setting process, Organizational, functional and individual Key result areas, Key performance indicators.

Unit-2: Performance Appraisal- Methods and approaches to performance appraisal-Traditional & modern - BO,BSC,BOS, assessment centers, Multirater assessment , Potential appraisal, Documentation and appraisal communication, appraisal interview,feedback , Performance coaching .Obstacles in appraisal, Performance Appraisal Interview, Potential Appraisal. 360^0 feedback.

Unit-3: Performance Management in Manufacturing, Services and IT Sector with special reference to NALCO, State Bank of India, Infosys and ITC, Strategies for improving performance. Performance Management and development Analyzing Performance problems. Performance Counseling Concept, Principles and Skills competency based Performance Management.

Unit-4: Performance Management Application & Improvement-. Performance Management linked Reward Systems Reward Management, Linkage of Performance Management to Reward and Compensation Systems "Do only what you get paid for" Syndrome, Types of pay for Performance Plans – Individual based, Team Based, Plant Wide Plans and Corporate Wide Plans.

Unit-5: Performance communication – formal & informal methods. Competency mapping – concept, competency mapping process & models, competency assessment personal competency framework, Core competencies PCMM – concept, benefits, HR score card.

Text books:

1. Performance Management, Aquinis - Pearson
2. Performance Management, Chadha, Macmillan
3. Performance Management, Armstrong, Michael, Baron, Jaico
4. Performance Management, Cardy – PHI
5. Arup Verma, Pawan S. Bhudwar & Angelo D. Nisi, Performance Management Systems-A Global Perspective, First Edition, Taylor & Francis, 2008,USA.
6. T.V Rao, Performance Management & Appraisal System, Sage Publication, 2004, New Delhi.

Reference Books:

1. Elizebeth Houldsworth & Dilum Jirasinghe, Managing & Measuring Employee Performance, 1st Edition, Kogan Page Publication, 2006,USA.
2. Michael Armstrong, A Handbook of Performance Management, Fourth Edition, Kogan Page Publication, 2009, USA.

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Course Title: **Training and Development** *(Elective-3)*	Course Code: **GAD6290**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III / IV**

Unit-1: The Role of Training and Development

Purpose of training and development. Types of training. Selecting training staff, The relationship of training and development to other functions: performance appraisal, staffing and compensation. Aligning training with strategy, Repositioning Training- Knowledge Competence, Training Learning, Models of training process.

Unit-2: Development and designing of a Training Programme

Systematic approaches to training programmes: conducting needs assessment, ensuring employees' readiness for training, creating a learning environment, ensuring transfer of training, establishing training objectives and preparing the partners, developing an evaluation plan, select training methods, monitor and evaluate the program.

Unit-3: Trainers and Training Styles

Traditional and contemporary training styles- E-Learning, Personal Needs of Trainers, Power and Influence: Two Modes, Trainers Role and Functions, Trainers Dilemmas, Ethical issues in the development of a training programme- such as fair selection of participants, Train the trainers, Managers as Partners at different stages of training

Unit-4: Employee Development and Evaluation

Favorable training climate, current trends in formal education for development, Managerial skills. Choosing resources appropriately and fairly. Mentoring relationship, Difference between coaching, mentoring, counselling and training, Redressing common imbalances in training programs, supporting innovation at work, Issues in evaluation, relevance of feedback.

Unit-5: The Future Trend of Human Resource Development

Contingency factors: internal and external environment. The future workplace. New technology. Training and Development as Source of Competitive Advantage, Impediments to Effective Training, cultural diversity and the role of training, Change management through training

TEXT BOOKS:

1. Rolf. P. Lynton and Uday Pareek, **Training for Development,** 3rd Ed.**,** Sage Publication, New Delhi.
2. Rolf P Lynton and Udai Pareek, **Training for organizational transformation**, Part 1, Sage.

RFERENCE BOOKS:

- Ron Stone, **The real value of training**, 1st Edition, McGraw Hills,
- Raymond. A. Noe, **Employee Training and Development,** 5th Edition, McGraw Hill .
- Raymond.A.Noe and Colin Winker, Employee **Training and Development**, 1st Edition, McGraw Hill
- R.K. Sahu, **Training for Development**, 1st Edition, Excel Books, New Delhi.
- Steeven.A. Beebe, Timothy.P.Mottet, and K.David. Roach, **Training and Development**, 1st Edition, Allyn and Bacon, 2004.

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Course Title: **Strategic Management**	Course Code: **GAD010**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **IV**

UNIT-1:

Introduction: Basic concepts of strategic management. Strategic decision-making. levels. & Process of strategic management strategic intent: Vision, Mission, Goals and Objectives. Organization Appraisal–organizational capabilities in various Functional areas and Strategic Advantage Profile. Methods and techniques used for organizational appraisal (Value chain analysis, Financial and non financial analysis, historical analysis, Industry standards and benchmarking, balanced scorecard and key factor rating). Identification of Critical Success Factors (CSF).

UNIT-2:

Environmental Appraisal—Concept of environment, components of environment (Economic, legal, social, political and technological). Environmental scanning techniques- ETOP, QUEST and SWOT (TOWS)., External and internal assessments- porter's five force model, IFE, EFE & CPM matrix used for assessments.

UNIT-3:

Corporate level strategies-- Stability, Expansion, Retrenchment and CoMBTination strategies. Corporate restructuring. Concept of Synergy. Business level strategies— Cost leadership, Differentiation and Focus strategies Strategic Analysis and choice The input, matching (TOWS, SPACE, BCG IE,& grand strategy matrix) and Decision stages (QSPM) of strategic analysis choice.

UNIT-4:

Strategic Implementation-nature of strategic implementation, polcies, resouse allocation, managing conflicts, managing structure with strategy (functional structure, divisional structure, SBU), restructuring, Reengineering & E- engineering, managing resistance to change, strategic budget allocation, Human resource concerns while implementing Corporate cultre & leadership-Leading the strategic execution process.

UNIT-5:

Strategy review evaluation and control-Nature of strategy evaluation, strategy-evaluation framework, measuring organizational performance, taking corrective actions. Levels of strategic control, contingency planning & auditing. Managing strategic change-process, determining need for change, styles and tactics of change management.

Text Books:

1. Fred.R.David Strategic Management-concepts & cases-Prentice Hall Publication
2. A Thompson,Mararet A Peteraf, John E GaMBTle, A J Strckland, A K Jain.Crafting & Executing strategy-concepts and cases
3. Ansoff, H Igor - Corporate Strategy
4. Charles W L Hill and G R Jones- Strategic Management Theory
5. Azhar Kazmi - Business Policy

Reference Books:

1. Thomos L Wheelen and J D Hunger- Strategic Management
2. Hamel G and Prahalad C K - Competing for the Future

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Course Title: **Business Intelligence and Data Warehousing** *(Elective-4)*		Course Code: **GAC6610**
Credit: 3	L **3**	T **0**	P **0**
Year: **2nd**		Semester: **III / IV**

Unit 1 : Introduction to BI and Data Warehousing

Brief History of Accessing, Reporting And Analyzing Data, Data to Information Lifecycle, Definition of Business Intelligence (BI), Definition of Data Warehousing, Definition of Corporate Performance Management (CPM), Evolution of BI, Role of DSS, EIS, MIS and dashboards, Data Warehouse and BI, usiness Drivers For BI, Business and IT Drivers For DW, Applications that use BI And DW ,Data Shadow Systems, BI Applications to Business, Business Analytics versus BI , BI component Framework, Business Layer, Administrative and Operational Layer, Implementation LayerBusiness Intelligence and Data Warehousing - The Architectures.

Unit 2: Digital Data

Structured data, Unstructured Data, Managing and storing unstructured data, Storage Challenges of Unstructured Data, Extraction of information from unstructured data, UIM Architecture for unstructured data. Semi-Structured Data, Sources of Semi structured Data.Managing, Storing and extracting information from semi-structured data, XML as a solution for Semi-structured data.

Unit 3 : OLAP and OLTP

OLTP, Advantages, challenges, Shortcomings of OLTP, OLAP, One Dimensional Data, Two Dimensional Data, Three Dimensional Data, Beyond Third Dimension, Advantages and Features of OLAP, OLAP Architectures, MOLAP, ROLAP, HOLAP, OLAP versus OLTP, Data Models for OLAP and OLTP, OLAP Operations on multi dimensional data: Slicing, Dicing, Roll Up, Drill Down, Drill Across, Drill Through

Unit 4 : Data Integration

Need for Warehouse, Data Mart, ODS, Kimball's approach versus Inmon's approach to Data warehousing, Goals of Data Warehouse, Data Sources for Data Warehouse, ETL, Data mapping, data staging, Approaches to Data integration, needs and advantages, Data Integration Technologies, Data Quality, maintaining data quality, Data Profiling.

Unit 5: Multi-Dimensional Data Modeling

Data Modeling Basics: Entity, Attribute, Cardinality, Types of Data Models: Conceptual data model, Logical data model, Physical model, Normalization modelling, Dimensional modeling, Fact Table, Dimension Table, Hierarchies and Types, Star and Snowflake Schema, Designing a dimensional model. MS Excel 2010 Based Activity

Unit 6: Performance Management& Enterprise Reporting

Measures, Metrics, KPIs and Performance Management - Measurement system Terminology, Role of Metrics, KPI and their usage, Sources of data for KPI and Metrics, Reporting Perspectives common to all levels, Common report layout types, Dashboards, Types of Dashboards, How to create dashboards?, BI Road Ahead - BI and mobility, BI and Cloud, BI and ERP, BI and CRM

Text Books:

1. David Loshin, Business Intelligence, Morgan Kaufmann Publishers.
2. Mike Biere, Business intelligence for the enterprise, IBM Press
3. Hoffer Jeffrey, Prescott Mary, Modern Database Management, Pearson.
4. Larissa Terpeluk Moss, ShakuAtre, Business Intelligence Roadmap, Addison-Wesley Information Technology Series.

Reference Books:

1. Cindi Howson, Successful Business Intelligence: Secrets to making Killer BI Applications, TMH
2. Stephen Few, Information dashboard design: The Effective Visual Communication of Data, O'Reilly Media.

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Course Title: **Data Analytics Fundamentals** *(Elective-4)*	Course Code: **GAC6620**		
Credit: 3	L **3**	T **0**	P **0**
Year: **2nd**	Semester: **III / IV**		

Unit 1: Overview of Analytics

What is analytics?, Types of problems in analytics, Case studies of application of analytics in business, When analytics does not work, Analytics vs. data warehousing, OLAP, Statistics, Widely used analytic software, Companies using analytics, Day in the life of a business analyst, Career path in analytics, Qualities of a business analyst

Unit 2: Statistics

Introduction to statistics, Summary statistics(Mean, Median, Mode, Variance),Probability, Probability distribution(Binomial, Poisson, Normal), Hypothesis testing, T-test, Chi-square test, ANOVA, Non parametric testing

Unit 3: Models and Algorithms

Modeling Terminology, Linear Regression, Logistics Regression, Decision Trees, MARS, Rule Induction, K-nearest, Neural Network, Genetic Algorithm

Unit 4: Analytic Methodology

Problem definition, Data selection, Data exploration, Data partition, Data cleansing, Data transformation, Modeling, Validation, Deployment, Assessment, re-start

Unit 5: Data Preparation

Why data preparation, Outlier treatment, Missing values treatment, Categorical variables, Dummy variables, Derived variables, Lag variables, Interaction variables, Variable transformation, Quadratic variables, Date, time variables, Sampling and partitioning, Preliminaries.

Unit 6: Data Analysis Techniques

Correlations, **Regression** (Basics of Regression, Linear Regression, Logistic Regression, Interpretation of modeling results, Violation of regression assumptions, **Decision Trees** (What are decision trees, Examples of trees, Terminology in decision trees, Data preparation for trees, How to create a tree? Measure of effectiveness (Gini, Chi-square, Information gain, Reduction in variance, Use of decision trees, When to use Decision trees? Widely used software for Decision trees, **Clustering (**What is clustering? types of clustering, K-means clustering, Measures of homogeneity, Data preparation, Hierarchical clustering, Cluster evaluation, Cluster profiling, When to use, Important considerations, **Pitfalls to avoid while modeling** (Misleading patterns, Biased population, Data at wrong level

Text Books:

1. R N Prasad and Seema Acharya, Fundamentals of Business Analytics, Wiley India.

Reference Books:

1. Minelli (2013), Big Data,Big Analytics: Emerging Business Intelligence and Analitic trends for today's business,2nd Edition ,Wiley India.
2. Levin and Rubin, (2013), Stastics for Management , 7th edition, Pearson Publication
3. Hair and Anderson(2013), Multivariate Data Analysis, 6th edition, Pearson Publication

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Course Title: **Financial Analytics** ***(Elective-4)***	Course Code: **GAD6630**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III / IV**

Unit-1: Introduction to Accounting, Basic Accounting Principles, Income Statement, Balance Sheet, Cash Flow Statement, Financial Ratio Analysis, Reading the Annual Report, Relevance of Economics, Microeconomics, Macroeconomics, Time value of money, Long term financing, Cost of capital, Risk and return, Capital Structure, Dividend Policy, Working Capital Requirements, Equity and Industry Analysis

Unit-2: Formatting of Excel Sheets, Use of Excel Formulae Function, Advanced Modeling Techniques, Data Filter and Sort, Charts and Graphs, Table formula and Scenario building, Lookups, pivot tables, Macros, Recording of Macros, understanding Visual Basic Environment (VBE)

Unit-3: Project evaluation, Stage of project, Construction & development phase, Prepare an Income Statement, Balance sheet, Cash Flow Statement, Geographic Revenue Sheet, Segment Revenue Sheet, Cost Statement, Debt Sheet, Analyze Revenue Drivers, Prepare Cash Flow Statements, Discounted Cash Flow Valuation, Pro-Forma Statements

Unit-4: Advanced macros & VBA, Recording Macros, Understanding the Basics of Macro Coding, Applications of Macros to Financial Modeling, Developing Sensitivity Table, Developing Scenario Analysis, Developing Simulation

Unit-5: Investment Banking – Merger & Acquisitions, Types of M&A: Merger, Acquisition, Consolidation, Spin-off, Developing M&A Models: Integration of Financial Statements between (Target and Acquirer), Developing Merger Model, Developing Synergies.

Text Books & Reference Books :

1. Day Alastair, Mastering Financial Modeling in Microsoft Excel, 2nd Edition, Pearson Publishers (2009)

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Course Title: **Human Resource Analytics** ***(Elective-4)***	Course Code: **GAD6640**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III / IV**

Unit 1: Introduction to Human resource Analytics, The Era/evolution of HR Analytics, Current State of HR Analytics.

Unit 2: Why analytics is important, The Strategic workforce framework, workforce analytics. Competency Mapping, Balance Scorecard, HR Matrix, Right Sizing and Emotional Intelligence.

Unit 3: Introduction to Human Capital Management: Purpose of HCM, Concept and methodologies, Issues and challenges, HCM data used for measurement, Approaches to measurement, Human and intellectual capital and ROI.

Unit 4: Reporting and data visualization: Data exploration, visualization, correlation and reporting. Predictive analysis-Trend analysis, Ratio analysis.

Unit 5- Markov Analysis, Probability Technique, Work Load Analysis, Work Study Analysis, Modeliing or Multiple productive Techniques, Multi variate analysis, HR analytics and Business Intelligence, Contemporary Practices in HR analytics- Cases.

Text Books & Reference Books:

1. The New HR Analytics By Jac-Fitz-Enz, Amacom (***1*** June 2010)
2. HR Analytics: Driving Return on Human Capital Investment- An Oracle White Paper September 2011.
3. Strategic Human Capital Management Jon Ingham, Elsevier Publication

Department of MBA
Detailed Syllabus for MBA
Batch: 2016-18

Course Title: **Marketing Analytics** ***(Elective-4)***		Course Code: **GAC6650**
Credit: 3	L **3**	T **0**	P **0**
Year: **2nd**		Semester: **III / IV**

UNIT-1:
An Introduction to marketing analytics, need and importance, Overview on based on experimental design, application of multiple regression models.

UNIT-2:
Developing marketing strategies, profiling customers based on Discriminant and logit analysis). Analysis exercises.

UNIT-3:
Developing marketing strategies, Segmentation & Targeting (Cluster analysis). Analysis exercises.

UNIT-4:
Positioning (MDS), Developing marketing programs, New Product Decisions, Design Process (conjoint analysis), Sales force and Channel Decisions

UNIT-5:
Price & Sales Promotion Decisions, Advertising and Communication Decisions, Project Proposal Presentations, Data analysis exercises. Future of Marketing Analytic

Text Books :

1. Lilien, Gary L. and Arvind Rangaswamy (2004), Marketing Engineering: Computer- Assisted Marketing Analysis and Planning, Revised Second Edition, Trafford Publishing. (ISBN 141202252-5) [Required]
2. Hair, Joseph, F. Jr., William C. Black, Barry J. Babin, Rolph E. Anderson, and Ronald L. Tatham (2006), Multivariate Data Analysis, 6th Edition, Pearson Prentice Hall. [Recommended, Optional]
3. Collica, Randall S. (2007), CRM Segmentation and Clustering: Using SAS Enterprise Miner, SAS Publishing. [Recommended, Optional] Marketing Engineering: Computer-Assisted Marketing Analysis and Planning, 2/E Gary L. Lilien. Arvind Rangaswamy, both of Penn State University ISBN-10: 0130355496 • ISBN- 13: 9780130355492 ©2002 • Prentice Hall • Cloth, 518 pp Published 01/08/2002 •

Reference Books:

1. Principles of Marketing Engineering, Gary L. Lilien, Arvind Rangaswamy, and Arnaud De Bruyn, Trafford Publishers, 2007.
2. *Marketing Analytics: Strategic Models and Metrics, by* Stephan Sorger, Create Space Independent Publishing Platform

DIT UNIVERSITY
Dehradun

Course Structure and Detailed Syllabus

of

MBA in Logistics & SCM

(In Association with Safeducate)

Batch 2016-18

Department of MBA
Course Structure of MBA in Logistics & SCM
(In Association with Safeducate)
Batch: 2016-18

Year: 1st **Semester: I**

Sr. No.	Course Code	Course Title	L	T	P	Credit
1	GAA010	Business Communication	3	0	0	3
2	GAA020	Business Economics	3	0	0	3
3	SAFE01	**Principles of Supply Chain**	3	0	0	3
4	GAA040	Financial Accounting and Analysis	4	0	0	4
5	GAA050	Management Concepts	2	0	0	2
6	GAA060	Marketing Management	3	0	0	3
7	GAA070	Organizational Behavior	3	0	0	3
8	GAA080	Statistics for Business Decisions	4	0	0	4
9	SAFE02	**Workshop by Safeducate (20 hrs)**	-	-	-	1
		Total Credits				**26**

Note: In Addition to the above course will proceed for the **Workshop** on Basics of Supply Chain Management conducted by SAFEEDUCATE - a specialist in Supply Chain and Logistics training

Year: 1st **Semester: II**

Sr. No.	Course Code	Course Title	L	T	P	Credit
1	GAB010	Business Research Methods	4	0	0	4
2	GAB020	Consumer Behavior	2	0	0	2
3	GAB030	Corporate Finance	3	0	0	3
4	GAB040	Global Business Environment	2	0	0	2
5	GAB050	Human Resource Management	3	0	0	3
6	SAFE03	**Logistics Management**	4	0	0	4
7	GAB070	Operation Management	3	0	0	3
8	SAFE04	**Workshop by Safeducate (20 hrs)**	-	-	-	1
		Total Credits				**22**

Note: At the end of second semester students shall undergo an industry oriented 6 to 8 weeks Internship at Safexpress Hub/Logistics Park Locations.

Department of MBA
Course Structure of MBA in Logistics & SCM
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Batch: 2016-18

Year: 2nd **Semester: III**

Sr. No.	Course Code	Course Title	L	T	P	Credit
1	GAC010	Business Ethics and Corporate Governance	2	0	0	2
2	GAD010	Strategic Management	3	0	0	3
3	SAFE05	**Project Management**	3	0	0	3
4	SAFE06	**Strategic & Operational Issues in Supply Chain Management**	3	0	0	3
5	SAFE07	**Supply Chain Performance Metrics & Modeling**	3	0	0	3
6	GAC620	Digital and Social Media Marketing	3	0	0	3
7	GAC6620	Data Analytics Fundamentals	3	0	0	3
8	SAFE08	**Summer Internship on Supply Chain & Seminar**	0	0	4	2
10	GAC4100	Industrial Visit	0	0	0	1
		Total Credits				**23**

Year: 2nd **Semester: IV**

Sr. No.	Course Code	Course Title	L	T	P	Credit
1	SAFE09	On the Job Training	-	-	-	12
2	SAFE10	Project Based on OJT	-	-	-	12
3	GAD180	Comprehensive Viva-voce	-	-	-	1
		Total Credits				**25**

<u>On the Job Training at Safe express hubs</u>

The students shall undergo On-job training at locations/ companies specified by Safeducate Pvt. Ltd. for a minimum period of **840 hrs**.

Department of MBA
Course Structure of MBA in Logistics & SCM
(In Association with Safeducate)
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List of Audit Courses offered across Semester

Semester	Course
I	**Soft Skills**
II	**Advanced Excel**
III	**Data Analysis using R**

Summary of Credit

Year	Semester	Credit		Year Credit
		Theory	Practical	
First Year	I	26	--	48
	II	22	--	
Second Year	III	20	3	48
	IV	0	25	
Total				96

Department of MBA
Course Structure of MBA in Logistics & SCM
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Batch: 2016-18

Course Title: **Business Communication**	Course Code: **GAA010**
Credit: 3	L T P **3 0 0**
Year: **1st**	Semester: **I**

UNIT-1:

Understanding the Foundation of Business Communication: Attitudes toward Indian Business through the years, characteristics of effective business messages, basic forms of communication, theories of communication, recognize the changing environment, communication in organizational settings, communication barriers, guidelines for overcoming communication barriers, communication of ethics and cross-cultural messages, working in teams, group dynamics, characteristics of effective teams, conflicts in teams, writing collaborative messages, guidelines for critiquing the writing of others, making your team meetings more productive, improving listening skills, improving nonverbal communication.

UNIT-2:

Writing Business Messages and delivering oral presentations: Three-step writing process, planning business messages, analyzing your purpose and audience, selecting the appropriate channel and medium, organizing your message, composing and shaping your messages, writing effective E-Mail messages, writing persuasive messages strategies and types, finding, evaluating and processing information, communication through visuals, writing business reports and proposals, planning oral presentations, writing oral presentations and mastering the art of delivery, overcoming anxiety, handling questions responsively, using visual aids in oral presentations, planning effective slides for oral presentations

UNIT-3:

Analyzing, writing and presenting a business case: Understanding the Case Method of learning, different types of cases, overcoming the difficulties of case method, reading a case properly-previewing, skimming, reading and scanning, case analysis approaches, Do's and don'ts of case reporting, steps for oral case presentations, reviewing the oral case analysis.

UNIT-4:

Corporate Communication: Corporate Communication-definition, concept and theories, an overview of corporate communication function in India, communicating with corporate brand, developing a reputation platform, communicating with key stakeholders: Internal and external communication, assessing the effectiveness of corporate communication, organizing corporate communication.

UNIT-5:

Crisis Communication and Media Management: Defining a corporate crisis, management mind sets that impede crisis management, four states of a crisis, crisis management process, writing a crisis management plan, developing a communication strategy to handle crisis, implement and evaluating a crisis management plan, inviting media response, writing press releases, conducting press conferences, preparing for media interview, post interview evaluation.

Text Books:

1. Business Communication Today, Bovee, Schatzman, Pearson (7th Edition)
2. Advanced Business Communication, J.M. Penrose, R.W. Rasberry, R.J. Myers, Thompson Learning (2nd Ed)
3. Essentials of Corporate Communication, B.M. Cees, Van Reil, C.J. Fombrun, Routledge.
4. Strategic Corporate Communication, P.A. Argenti, Tata McGraw-Hill.
5. C.L. Bovee and J.V. Thill, **Business Communication Today**, 10th Edition, Pearson.
6. Dalmar Fisher, Communication in Organization, 2nd Edition, Jaico Publishing House, New Delhi.
7. P.A. Argenti**, Strategic Corporate Communication**, 4th Edition, Tata McGraw-Hill.

Reference Books:

1. Michael B. Goodman and Peter B. Hirch**, Corporate** Communication- strategic adaptations for global practice**,** Peter Lang Publishing, New York.
2. B.M. Cees, Van Reil, C.J. Fombrn, **Essentials of Corporate Communication**, 1st edition, Routledge.
3. Owen Hargie, David Dickson and Dennis Tourish, **Communication Skills for effective management**, 1st Edition, Palgrave, Macmillan.
4. Meenakshi Raman and Prakash Singh, **Business Communication, Second Edition,** Oxford University Press**.**

Department of MBA
Course Structure of MBA in Logistics & SCM
(In Association with Safeducate)
Batch: 2016-18

Course Title: **Business Economics**	Course Code: **GAA020**
Credit: 3	L **3** T **0** P **0**
Year: **1st**	Semester: **I**

UNIT-1:

Managerial Economics: Introduction, Nature and Scope, Objectives of the Firm, Theories of the Firm Sales and Revenue Maximization Theory, Profit Maximization Theory, Behavioural Theories.

UNIT-2:

Demand Analysis: Demand- Meaning, Types and Determinants of Demand, Demand Function- Law of Demand, Law of Supply, Elasticity of Demand- Methods, Determinants and Managerial Uses. Demand Forecasting- Purpose, Quantitative and Qualitative Techniques of Demand Forecasting, Criteria for Good Forecasting Method.

UNIT-3:

Production Analysis: Production Function- Law of Variable Proportions, Isoquant and Isocost Curves, Least Cost Combination, and Law of Returns to Scale, Cobb-Douglas Production Function and Constant Elasticity of Substitution, Cost Concepts, Cost Oriented Pricing Methods.

UNIT-4:

Market Analysis: Market Structures, Output and Pricing Decisions- Perfect Competition, Monopoly, Oligopoly and Monopolistic Competition, Profit- Meaning and Theories.

UNIT-5:

Pricing Strategies, Full Cost, Product Line Skimming and Penetration Pricing, Concept of National Income, Methods of measurement of National Income, Concept of Inflation, Measures to Control, Concept and phases of Business Cycle.

Text books & Reference Books:

1. Dean, Joel, Managerial Economics, Prentice Hall India (2007).
2. Peterson, H. Craig, Lewis, W. Chris and Jain, Sudhir K. Managerial Economics, Pearson Education (2006).
3. Mehta, P.L., Managerial Economics: Text and Cases, S. Chand and Co. (2007).
4. Sameulson, Paul A. and Nordhaus, William D., Economics, .
5. Dewett, K.K., Modern Economic Theory, S. Chand and Co. (2006)
6. Mansfield, E., Allen, W.B. and Doetry, N.N., Managerial Economics: Theory, Applications and Cases, WW Norton and Company (2002).

Department of MBA
Course Structure of MBA in Logistics & SCM
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Batch: 2016-18

Course Title: **Principles of Supply Chain**	Course Code: SAFE01
Credit: 3	L **3** T **0** P **0**
Year: **1st**	Semester: **I**

In this Course we will help you to understanding the entireSupply chain management, Supply Chain Cycle and the flows of Supply Chain Flows, Types of Supply Chain why it is necessary to have the knowledge of Network in SCM what/who are the Processes & Players involved in Supply chain management cycle. How Supply Chain helps in Integration the process to utilize the maximum utilization of resources and what is Global Supply Chain.

Supply chain management touches major issues, including the rapid growth of multinational corporations and strategic partnerships; global expansion and sourcing; fluctuating gas prices and environmental concerns, each of these issues dramatically affects corporate strategy and bottom line. Because of these emerging trends, supply chain management is the most critical business discipline in the world today.

Specifically this course will cover following topics-

- Evolution of the supply chain and present day supply chain
- Supply Chain Strategy
- Supply Chain Cycle
- Supply Chain Flows
- Types of Supply Chain
- Supply Chain Network Planning
- Processes and Players in Supply Chain
- Supply Chain Environment
- Introduction to International / Global SCM (Module)

Department of MBA
Course Structure of MBA in Logistics & SCM
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Course Title: **Financial Accounting and Analysis**	Course Code: **GAA040**
Credit: 4	L T P **4 0 0**
	Semester: **I**
Year: **1st**	

UNIT-1

Introduction to Accounting: Definition, Nature, Objectives, Scope, Accounting Cycle, types of accounting and Limitations of Accounting, Accounting concepts, conventions and principles; accounting equation, systems of book keeping IFRS.

UNIT-2

Mechanics of Accounting: Double entry system of accounting, journalizing of transactions; Posting Transactions into Ledger, Sub-division of Journals, Preparations of Trial Balance, Preparation of final accounts with adjustments.

UNIT-3

Financial Statement Analysis: Financial Statements - Meaning, Nature and Limitations. Reconstruction of Income Statement and Position Statement. Meaning of Financial Analysis. Significance of Financial Analysis to Different Parties. Vertical Vs. Horizontal Analysis. Internal Vs. External Analysis

UNIT-4

Techniques of Financial Analysis: Accounting Ratios - Meaning, Significance and Limitations. Classification of Accounting Ratio. Computation and interpretation of Liquidity Ratios. Leverage
Ratios. Activity/ turnover Ratios and Profitability Ratios. Funds Flow Statement - Meaning and Need.
Preparation and Interpretation of schedule of working capital changes and Funds Flow Statement. Cash Flow Statement - Meaning, Need, Preparation and Interpretation(AS3)

UNIT-5

Budgetary Control and Decision Making*:* Concept of Budget and Budgetary Control; Types of Budget: Cash Budget and Flexible Budgets. Cost Volume Profit Making Analysis, Concept of Marginal Costing, Differential Costing and Absorption Costing

Text Books:

1. Robert n Anthony, Hawkins and Merchant, Accounting TMH
2. Maheshwari S.N & Maheshwari S K – An Introduction to Accountancy (Vikas, 9th Edition)
3. Tulsian PC ―Financial Accounting, Pearson Education
4. Khan, M.Y., and P.K. Jain, Management Accounting, 6th ed., Tata McGraw Hill, New Delhi, 2009
5. Ashish Bhattacharyya, Essentials of Financial Accounting, PHI
6. Chandan Sengupta, Financial Analysis and Modeling using Excel and VBA, 2nd Edition, Wiley India Pvt. Ltd., New Delhi, 2011.

Reference Books:

1. Martin Fridson& Fernando Alvarez, Finance Statement Analysis, 4th Edition, Wiley India Pvt. Ltd.-New Delhi, 2011.
2. Donna Phil brick & Charles T. Horngren, Introduction of Financial Accounting, 9th Edition, Pearson education, New delhi, 2008.
3. T.P. Ghosh, Accounting for Managers, 4th Edition, Taxmann's Publication, New Delhi 2009.
4. Prasanna Chandra, Finance Sense: Finance for Non- Finance Executives, 4th Edition, McGraw Hill Education, New Delhi, 2012.

Department of MBA
Course Structure of MBA in Logistics & SCM
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Batch: 2016-18

Course Title: **Management Concepts**	Course Code: **GAA050**		
Credit: 2	L	T	P
	2	**0**	**0**
Year: **1st**	Semester: **I**		

UNIT-1

Introduction to Management- Definitions, nature and scope of management, functions and process of management, Management-science or art? Patterns of management analysis from Taylor, Fayol, Max Weber to the present. Growth of professional management in India. International Management cultural and country differences, management and society-Environment, social responsibility and ethics.

UNIT-2

Essentials of Planning-Planning process, types of plans, Forecasting and its techniques, Managerial decision-making process and models, Concepts of MBTO & MBTE. Organization: Organizational theories and design, various forms of organization structures, span of management principles of coordination, Authority, Power, delegation, decentralization and Empowerment.

UNIT-3

Staffing & Managerial Communication: Meaning & process of staffing, recruitment & selection, training & development, job analysis & appraisal. Meaning & scope of communication, Importance of communication in management, the communication process and its types, Barriers to effective communication.

UNIT-4

Leadership and motivation: meaning, nature, scope of leadership, theories of leadership and its implications, leadership styles and managerial grid, importance of motivation and its types, theories of motivation.

UNIT-5

Nature & scope of managerial control, types of control systems and techniques – budgetary and statistical quality control, Japanese management techniques, TQM, Kaizen, JIT, The peter's principle. Concept of coordination. Management of change-Resistance to change, change models, change agents.

Text Books:

1. Essentials of Management; Koontz and O"Donnell. E; McGraw Hill
2. Introduction to Management; Fred Luthans; McGraw Hill

Reference Books:

1. The Practice of Management; Peter F. Drucker

Department of MBA
Course Structure of MBA in Logistics & SCM
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Course Title: **Marketing Management**	Course Code: **GAA060**
Credit: 3	L **3** T **0** P **0**
Year: **1st**	Semester: **I**

UNIT-1:
Marketing Concepts: Nature and Scope of Marketing, Core Marketing Concepts, And Company Orientation toward the Marketplace

UNIT-2:
Marketing Enablers: Marketing Environment, Consumer Markets, Business Markets, Buying Decision Process, Participants in the Buying Process

UNIT-3:
Strategic Marketing: Strategic Planning, Marketing Planning, Market Segmentation, Targeting and Positioning.

UNIT-4:
Marketing Mix: Product Decisions, Pricing Methods and Strategies, Promotion Mix, Place, Marketing Plans Implementation, Evaluation and Control.

UNIT-5:
Contemporary Issues in Marketing: Globalization, Consumerism, Green Marketing, Legal Issues Consumer Protection Act.

Text books & Reference Books:

1. Kotler, P., Marketing Management, Prentice Hall (2007)
2. Ramaswamy, V. S. and Kumari, N., Marketing Management-Planning, Implementation and Control, McMillan India (2006)
3. Saxena, R., Marketing Management, Tata McGraw Hill (2003)
4. Lilien, Gary L.; Rangaswamy, Arvind and Bruyn, Arnaud De, Principles of Marketing Engineering, Trafford Publishing (2007)

Department of MBA
Course Structure of MBA in Logistics & SCM
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Course Title: **Organizational Behaviour**	Course Code: **GAA070**
Credit: 3	L T P **3 0 0**
Year: **1st**	Semester: **I**

UNIT-1:
Organizational Behavior- Nature, Importance and Scope; Models of OB; Managing Workforce Diversity; Emerging Challenges for Management and OB, Determinants of Individual Behavior.

UNIT-2:
Foundations of Individual Behavior- Values, Attitudes, Personality, Perception and Emotions; Transactional Analysis; Johari Window; Motivation- Importance and Theories; Determinants of Personality; Personality Attributes influencing OB; Interactive Behavior and Interpersonal Conflict.

UNIT-3:
Foundations of Organizational Structure, Work Design and Technology, , Organizational Culture & Climate, Organizational Learning- Importance and Theories; Learning and Behavior Modification; Principles of Learning & Reinforcement.

UNIT-4:
Team Building and Group Dynamics; Working Teams and Team Effectiveness; Intra-Team Dynamics; Dynamics of Managerial Leadership; Leadership- Transition of Leadership Theories; Implementation of Leadership Theories in Contemporary Business Environment.

UNIT-5:
Organizational Conflicts; Power & Politics –Concept of Authority & Power; Sources of Power, Unequal Power in Organization, Organizational Politics, Dysfunctional Aspects of Politics, Organizational Communication, Functional and Dysfunctional Conflicts, Stages in Conflict.

Text Books:

1. Organizational Behaviour, Understanding and Managing life at work, 7th Ed., Johns, G., & Saks, A. Pearson.
2. Organizational Behaviour, 7th ed. ,by Luthans, Fred McGraw-Hill, New York
3. Organizational behaviour,9th edition by Stephen P.Robbins. Prentice Hall International, Inc..
4. Luthans, Fred, Organizational Behaviour: An evidence based approach, 12th edition. Tata McGraw Hill

Reference Books:

1. Johns, G., and Saks, Organizational Behaviour- Understanding and Managing life at work, 7th Ed., Pearson.
2. Gerard H. Seijts, Cases in Organization Behavior, 1st Edition, Sage.
3. Jerald Greenberg, Behavior in Organizations, 10th Edition, Prentice Hall.
4. Uday Pareek, Understanding Organizational Behavior**,** 3rd Edition, Oxford University Press,

Department of MBA
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Course Title: **Statistics for Business Decisions**	Course Code: **GAA080**		
Credit: 4	L	T	P
	4	**0**	**0**
Year: **1st**	Semester: **I**		

UNIT-1

Introduction to the Practice of Statistics, Measures of Central Tendency- mean, median, mode, Properties and applications, Measures of Dispersion: Range, Mean deviation, Standard deviation, Coefficient of Variation, Skewness, Kurtosis.

UNIT-2

The Concept of Probability. Sample space and Events, The addition rule and complements Conditional Probability & the General Multiplication Rule. Random variable (discrete and continuous) and probability distribution, Properties of the Normal Distribution, The Binomial Probability Distribution, The Poisson Probability Distribution

UNIT-3

Hypothesis in Business Decisions (Basic Concepts), Estimation Theory and Hypothesis Testing: Sampling theory; Formulation of Hypotheses; Application of Z test, t-test, F-test and Chi-Square test.

UNIT-4

Concept of Correlation and Regression and its types, Karl Pearson correlation, Linear regression defined, An overview on regression, testing the Significance of the Least-Squares Regression Model, Multiple and partial correlation and regression.

UNIT-5

Time Series Analysis: Concept and applications in business decision-making, Additive and Multiplicative models, Components of time series, Trend analysis: Least Square method - Linear equations

Text Books:

1. Robert n Anthony, Hawkins and Merchant, Accounting TMH
2. Ghosh T P - Accounting and Finance for Managers (Taxman, 1st Edition).
3. Maheshwari S.N & Maheshwari S K – An Introduction to Accountancy (Vikas, 9th Edition)
4. Tulsian PC —Financial Accounting, Pearson Education
5. Khan, M.Y., and P.K. Jain, Management Accounting, 6th ed., Tata McGraw-Hill, New Delhi, 2009
6. Ashish Bhattacharyya, Essentials of Financial Accounting, PHI **Reference Books:**
1. Business Statistics : For Contemporary Decision Making by Ken Black, , Publisher: Wiley
2. Statistics for Managers Using Microsoft Excel and Student CD Package (4th Edition) by David M Levine, David Stephan, Timothy C. Krehbiel, Mark L. Berenson, Hardcover: 880 pages, Publisher: Prentice Hall
3. Business Statistics using Excel, Glyn Davis and BrankoPecar, Oxford University Press, USA

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Course Title: **Workshop by Safeducate (20 hrs**)			Course Code: **SAFE02**
Credit: 1 (20 Hours Weekly Mode)	L **0**	T **0**	P **0**
Year: **1st**			Semester: **I**

Workshop is composed of two to three days of topical sessions, supported by case studies and exercises, exploring the breadth of supply chain and its relevance to the overall business. The sessions are highly interactive, and teaching points are supported by specific and relevant real world examples, led by recognized experts in the field. Faculty members are able to adapt and focus is on specific industry, or to include special attention to specific industry or geographic issues. The major topic that will be covered in this workshop is Creative Problem Solving in SCM Part-I

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Course Title: **Business Research Methods**	Course Code: **GAB010**
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: **II**

UNIT-1:

Introduction to Business Research Methods: Concept and Nature of Research Methods, Types of Research, Applications of Research Methods in Business, Research Process.

UNIT-2:

Types of Research Design: Exploratory, Descriptive and Experimental, Development of Research Designs, Problem identification, Types of Sampling Methods, Sampling Process, Sampling Design Preparation.

UNIT-3:

Types of Data: Primary and Secondary, Sources of Secondary Data, Methods of Primary Data Collection – Interviews, Questionnaires, Schedules and Observation, Likert, Turnstone, Staple, Semantic, Constant Sum, Rating and Ranking Scales, Questionnaire Designing, Manual and Computerized Data Processing Methods.

UNIT-4:

Statistical Techniques for Data Analysis: Testing of Hypothesis, Interpreting Data; Report Writing, Ethical Issues in Business Research and Measurement of Effectiveness.

UNIT-5:

Introduction to Multivariate Analysis: Factor Analysis, Discriminant Analysis, Cluster Analysis, and Conjoint analysis.

Text Books & Reference Books:

1. Umasekaran, B., Research Methods for Business, John Wiley and Sons (2005).
2. Saunders, M. and Lewis, P., Research Methods for Business Students, Prentice Hall
3. Business Research Method , W. Zikmund Thomson Publication

Department of MBA
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Course Title: **Consumer Behaviour**	Course Code: **GAB020**
Credit: 2	L **2** T **0** P **0**
Year: **1st**	Semester: **II**

Unit I:
Introduction to Marketing & Consumer Behavior, Psychology & Consumer Behavior, Buyer Various Aspects, Models of Comprehensive Buyer Behavior, Overview of Consumer Behavior Decision Process, Case study

Unit II:
Culture, Social Class Variables Impacting Consumer Behavior, Sub Culture, Reference Group Variables Impacting Consumer Behavior, Family Variables Impacting Consumer Behavior, Learning and Memory, Case Study

Unit III:
Personality and concept of self, Motivation, Emotion, Perception, Information Processing, Problem Recognition, Case Study

Unit IV:
Individual Determinants of Consumer Behaviour – Needs and Motivation, Personality and Self Concept, Perception, Learning, Attitude

Unit V:
Models of Industrial Buying Behavior, Patterns of Industrial Buying Behavior in India, Diffusion of Innovation, Perception, Trust, Selectivities, Cross-cultural Consumer Behavior, Case Study

. **Text Books**

1. Consumer Behaviour and Branding: Concepts, Readings and Cases-The Indian Context, S Ramesh Kumar
2. Hoyer, Wayne and Deborah McInnis. *Consumer Behavior*. Boston: Houghton Mifflin
3. Kardes, Frank (2008), Consumer Behavior Science and Practice, Sputh-Western
4. Solomon, Michael, Gary Bamossy, Søren Askegaard, and Maragreth Hogg (2009), Consumer Behaviour: A European Perspective, 3rd Edition, Pearson **Reference:**

1. Roger D Blackwell ,Paul W Miniard ,James F Engel, ―Consumer Behavior‖, 1st India Edition, 2008, South Western
2. Del Hawkins, David Mothersbaugh, Amit Mookerjee, ―Consumer Behavior: Building Marketing Strategy‖, 11th Edition, 2010, , Tata McGraw Hill
3. Consumer Behaviour: Global Edition, 10/E, Michael Solomon, Pearson Higher education
4. Consumer Behaviour**,** Jim Blythe, 2nd edition, Sage publication

Department of MBA
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Course Title: **Corporate Finance**	Course Code: **GAB030**
Credit: 3	L T P **3 0 0**
Year: **1st**	Semester: **II**

UNIT-1: Introduction to corporate finance

Types of financial management decisions, the role of the financial manager, forms of business organizations, the goal of financial management, balance sheet, income statement, cash flow, Financial statement analysis.

UNIT-II: The time value of money

Time value of money, simple interest vs. compound interest, cash flow diagrams, future value and compounding, present value and discounting, uneven cash flow and annuity, calculate present worth, future worth and annual worth, discounted cash flow valuation, effective interest rate, annual percentage rate, multi period interest, continuous compounding, capital recovery and sinking fund model.

UNIT-III: Capital Structure and Financing Decisions

The elements and role of financial planning, Cost Vs Earning theories of capitalization, Stages of Capitalization, Capital structure-Concept, Optimum CS, Pattern of Capital Structure, Trading on Equity, Capital Gearing- Types, Capital Structure: Basic Concepts, Theories of Capital Structure, Leverage- Financial, Operating and Combined leverage- Computation, Cost of capital-Concept, Computation of Cd, Cp, Ce, Cr, New equity shares, WACC Computation.

UNIT- IV: Investment Decisions

Long term vs. short term investment, Concepts and procedures of capital budgeting, investment criteria (net Present value, payback, discounted payback, average accounting return, Internal rate of return, profitability index), working capital management- Concept and Computation of Working Capital- Forecasting of CA & CL Method and Operating cycle method.

UNIT- V: Dividend Decisions:

Concept and Types of dividend, Procedural aspects of declaration & payment of dividend, Dividend policy-Types- Strict, Liberal, Stable, constant payout ratio & D.P.S. ratio, Factors affecting dividend policy, Dividend decisions and valuation of firm-Walter's VS Gordon Approach- Computation, MM Approach-Computation.

Text Books:

1. Ross, Westfield & Jaffe, The McGraw-Hill Companies, Inc., 2009.
2. Principles of Corporate Finance, 9th ed., Brealey, Myers & Allen, The McGraw-Hill Companies, Inc., 2007.
3. Financial Management: Theory and Practice, Brigham & Ehrhardt, 10th edition, Cengage Learning, 2002.
4. Fundamentals of Financial Management, 12th edition, Horne & Wachowicz, Pearson Education, Inc., 2005
5. Bearly,Myers and Allen, Principles of Corporate Finance, 9th, McGraw Hill, New York, 2014

Reference Books:

1. I M Pandey, FINANCIAL MANAGEMENT, 9th, Vikas Publishing House, New Delhi, 2014
2. Berk, Jonathan, and Peter De Marzo, Corporate Finance, 2nd, Prentice Hall, New Jersey, 2010

Department of MBA
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Course Title: **Global Business Environment**	Course Code: **GAB040**
Credit: 2	L **2** T **0** P **0**
Year: **1st**	Semester: **II**

UNIT-1:
Global Business Environment: Definition, Concept and Scope, Components and Significance- Economic, Political, Social, Cultural, Legal and Technological Environment, Dimensions of International Business Environment and Challenges- Recent World Trade and Foreign Investment Trends.

UNIT-2:
Indian Economic Environment: Structure of Indian Economy- Public, Private, Joint and Co- operative Sectors, Overview of Planning in India, Industrial Policy, Trade and Commerce Policy, and Foreign Policy, Emerging Trends in Indian Business Environment, Indian Companies- Competitiveness, Changes and Challenges.

UNIT-3:
Economic Systems and Dynamics: International Trade Theories, Balance of Payments- Concepts, Disequilibrium in BOP and Methods of Correction, Overview of Indian Financial System.

UNIT-4:
Globalization and International Trade: International Economic Integration- Country Evaluation and Selection, Foreign Market Entry Methods, Trade Barriers and Trade Strategy- Free Trade vs. Protection, International Trading Blocks- EU, NAFTA, Asian Common Market, AFTA and SAARC, Impact of WTO on India.

UNIT-5:
International Institutions: WTO, IBRD (World Bank), IMF, IFC and ADB- Objectives, Organization Structure and Functioning.

Text Books:

1. A.C. Fernando, ***Business Environment***, Pearson Education.
2. Justin Paul , ***BUSINESS ENVIRONMENT: TEXT & CASES***, Tata McGraw-Hill Education 3. Cherunilam, F., Business Environment, Himalaya Publishing House (2007).
4. Cavusgil, S. Tamer, Gary Knight, John R. Riesenberger, International Business: Strategy, Management and New Realities, Pearson Education (2009).

Reference Books:

1. Hill, Charles W., Arun K. Jain, International Business, Tata McGraw Hill (2008).
2. Richard, M.S. and Luciara, N., Managing in the Global Environment, PHI (2006).

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Course Title: **Human Resource Management**	Course Code: **GAB050**
Credit: 3	L T P **3 0 0**
Year: **1st**	Semester: **II**

UNIT-1:
Human Resources Management: Definition, scope, objective and functions of Human Resources Management Human Resources Policy: Definition, importance, characteristics of good HR Policy Human Resources Planning: Definition, importance, barriers of HR Planning, HR Planning Process.

UNIT-2:
Job Analysis and Design: Definition, Process of Job Analysis, Job Design, Factors affecting job Design, Process of Job Design. Human Resource Recruitment: Definition, factors governing recruitment, recruitment process. Selection: Definition, Selection Process. Placement: Meaning, Problems in Placement.

UNIT-3:
Orientation: Meaning, typical Orientation Program, Evaluation of and Problems in Orientation, Promotions and Transfers, Retrenchment and VRS. Training and Development: Inputs in Training and development, Training Process, deriving Instructional Objectives, Design, Implementation and Evaluation of the Training Programme. Performance Management- Different elements of Performance Management, process and evaluation techniques, issues and dilemmas, context and design model of system.

UNIT-4:
Employee Remuneration: Components of Remuneration, Fringe Benefits, Perquisites, Non Monetary benefits, Remuneration Plans, Devising Remuneration Plans, Concepts of Wages, Minimum Wages, Fare Wages. Incentive payments: Meaning, Types of Incentive system Human Resource Management and Ethics: Importance of HRM ethics, Ethical Issues in HRM Employee Welfare: Meaning, Types of Welfare Activities, welfare facilities by the Government, Welfare Activities by the Trade Unions.

UNIT-5:
Balance Scorecard –Factors that led to thinking about scorecard approach, idea Underling BSC, Research by Kaplan and Norton Introducing BSC- step By- Step, case studies project work.

Text Books:

1. Gary Dessler: Human Resource Management, Pearson Education India.
2. VSP Rao: Human Resource Management, Excel Books
3. Arun Monappa: Managing Human Resources, McMillan
4. Kesho Prasad: Strategic Human Resource Management, Prentice Hall India
5. K. Aswathappa, Human Resource Management, 7th Edition, Tata McGraw-Hill 2013, New Delhi.
6. P. Subba Rao, Essentials of Human Resource Management & Industrial Relations, Third Edition, Himalaya Publication House, 2008, Mumbai.

Reference Books:

1. Micheal Armstrong, A handbook on Human Resource Management, 10th Edition, Kogan pae limited, 2007, USA
2. John Bratton & Jeff Gold, Human Resource Management-Theory & Practices, Palgrave Macmillan, 2012.
3. H. John Bernardin, Human Resource management- An Experential Approach, 4th Edition, Tata McGrawHill, Noida,2007
4. VSP Rao, Human Resorce Management, 2nd Edtition, Excel Books, 2008, New Delhi.

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Course Title: **Logistics Management**	Course Code: **SAFE03**
Credit: 4	L **4** T **0** P **0**
Year: **1st**	Semester: **II**

These courses give you the theoretical, as well as the practical knowledge to carefully manage the supply chain operations of a company. Specifically, you will look at the planning, procurement, pricing, stock management and distribution or logistics of businesses.

The course helps students to, examines current practices, trends and issues in logistics and supply chain management. Students review decision making processes and analytical techniques employed by real logistics professionals. The program provides specialist knowledge of logistics and supply chain management and a basic training in related business disciplines. The core modules cover themes around Distribution Centers, Multi Modal Freight Transport, Global Purchasing and Supply, Inventory and Operations Management, and Strategic Logistics and Supply Chain. An upcoming area, Green Logistics, which is already gaining wide

In short, students would gain a competitive advantage. Logisticians will undoubtedly increase competitive advantage where they can develop demand gauges.

There are personal benefits to doing such a course as well. It helps in improving employability and earning potential and open up career paths such as inventory planning, distribution planning, logistics management, import and export management, transportation management and supply chain management

- Introduction to Logistics
- Functions & Types of Logistics
- Transportation & Distribution Management
- Warehouse Operations
- Investigating Logistics Performance and Parameters
- Information & Communication technology in Logistics
- Reverse Logistics
- Domestic Documentation
- Transportation Problem
- Network Analysis
- Scheduling
- Freight Transport System
- IT Networking

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Course Title: **Operation Management**	Course Code: **GAB070**
Credit: 3	L T P **3 0 0**
Year: **1st**	Semester: **II**

UNIT-1:

Introduction to Operations Management: Operations Management Defined, Need of Operations Management, Nature & Scope of Operation Management, Relationship with other functional areas, Concept of Goods vs Services, Overview of Operations Strategy, and Theory of Slack Ropes.

UNIT-2:

Product and Process Design: Introduction to Process design, Product – process matrix, Process design in Services, Product Design and Service Design, Design for manufacturing, Design for AsseMBTly and modular design, Concept of Quality Function Deployment and House of Quality.

UNIT-3:

Facility Layout and Location Selection: Concept of Facility Location and various methods for location selection, Facility Layout: Product layout, Process Layout, Hybrid and other forms of layout, Advantages and Disadvantages.

UNIT-4:

Overview of Supply Chain and Inventory management: Introduction to Supply Chain Management and its importance in Operations management, Bullwhip Effect Inventory Management, WIP, EOQ Model, ABC Classification, Forecasting and its different methods, Capacity Planning and Aggregate Production Planning, MRP, Scheduling.

UNIT-5:

Quality Management: Overview of Quality Management, Quality: Definition, Dimension, Types of Waste, KANBAN System, Total Quality Management (TQM), Overview of Six Sigma.

Text Books:

1. Chase, Aquilano and Jacobs, Production and Operations Management, Tata McGraw- Hill (2006).
2. Russell, R. S. and Taylor III, B. W., Operations Management, Pearson Education (2006).
3. Lee J. Krajewski & Larry P. Ritzman, Operations Management: Strategy and Analysis, Pearson Education (2006).
4. Evans and Collier, Operations Management, Cengage Learnings (2007)
5. Gaither and Freizer, Operations Management, Cengage Learnings (2004)
6. P. Rama Murthy, Production and Operation Management, 3rd Edition, New Age International Publishers, New Delhi, 2013.
7. Shailendra Kale, Production & Operation Management, 1st Edition, Mc Graw Hill, Mumbai, 2013.
8. Prof. K. C. Jain, Dr. P. L. Verma, Mr. Prabhat Kartikey, Production and Operation Management, Wiley India Pvt. Ltd., New Delhi.
9. Martin K. Starr, Production and Operation Management (Biztantra), Wiley India Pvt. Ltd. , New Delhi.

Reference Books:

1. Jack R. Meredith and Scott M. Shafer, 5th Edition, International Student Version, Wiley, New Delhi, 2012.
2. R.B. Khanna, Production and Operation Management,
3. P.B. Mahapatra, Operation Management-A Quantative Approach, PHI, Delhi,
4. J.P. Saxena, Production and Operation Management, 2nd Edition, Tata McGraw hill education, New Delhi, 2012.

Department of MBA
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Course Title: **Workshop by Safeducate (20 hrs**)			Course Code: **SAFE04**
Credit: 1 (20 Hours Weekly Mode)	L **0**	T **0**	P **0**
Year: **1st**			Semester: **II**

Workshop is composed of two to three days of topical sessions, supported by case studies and exercises, exploring the breadth of supply chain and its relevance to the overall business. The sessions are highly interactive, and teaching points are supported by specific and relevant real world examples, led by recognized experts in the field. Faculty members are able to adapt and focus is on specific industry, or to include special attention to specific industry or geographic issues. The major topic that will be covered in this workshop is Creative Problem Solving in SCM Part-II

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Course Title: **Business Ethics and Corporate Governance**	Course Code: **GAC010**		
Credit: 2	L **2**	T **0**	P **0**
Year: **2nd**	Semester: **III**		

UNIT-1:
Introduction to Business Ethics: An understanding of Ethics ,Meaning of Ethics, Def. of Business Ethics, Ethical Performance ,Types of Ethics, Sources of Ethics, Ethics and Business ,Importance and Scope of Ethics, Factors influencing Business Ethics, Objective of Business Ethics, Morality and Ethics.

UNIT-2:
Values, Norms, Beliefs and Standards: Ethical Codes, Managing Ethics, Ethical Activities, Ethical Dilemmas, Whistle Blowing.

UNIT-3:
Ethical Decision: Making the role of Moral Philosophies in Decision Making, Ethical Organization, Ethical Issues that arise for Mangers, Kohlenberg's Model, Carrol Gilligan's Model.

UNIT-4:
Ethical Practices in Business Management: Application in Marketing, Advertising, Finance- Tax Evasion, Lack of Transparency, Preparing False Financial Statement, Speculation and Insider Trading. Application in HRM area like Compensation, and Work Place Harassment of Employee.

UNIT-5:
Corporate Governance: Introduction, Concept and Need for Corporate Governance, Definitions, Parties to Corporate Governance, Agency Theory, Stewardship Theory, Popular Model for Governance, Anglo-American Model, Japanese Model and Indian Perspective of Corporate Governance.

Text Books:
1. CSV Murthy, Business Ethics (Text and Cases), HPH

Reference Books:
1. Marianne M. Jennings, Cases in Business Ethics, Cenage Learning
2. Dr. Sanjay Mohapatra, Case Studies in Business Ethics and Corporate Governance, Pearson Education.
3. Ananda Das Gupta, Ethics, Business and Society**:** Managing Responsibly, 2010, SAGE

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Course Title: **Strategic Management**	Course Code: **GAD010**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III**

UNIT-1:

Introduction: Basic concepts of strategic management. Strategic decision-making levels. & Process of strategic management strategic intent: Vision, Mission, Goals and Objectives. Organization Appraisal–organizational capabilities in various Functional areas and Strategic Advantage Profile. Methods and techniques used for organizational appraisal (Value chain analysis, Financial and non-financial analysis, historical analysis, Industry standards and benchmarking, balanced scorecard and key factor rating). Identification of Critical Success Factors (CSF).

UNIT-2:

Environmental Appraisal—Concept of environment, components of environment (Economic, legal, social, political and technological). Environmental scanning techniques- ETOP, QUEST and SWOT (TOWS)., External and internal assessments- porter's five force model, IFE, EFE & CPM matrix used for assessments.

UNIT-3:

Corporate level strategies-- Stability, Expansion, Retrenchment and Combination strategies. Corporate restructuring. Concept of Synergy. Business level strategies— Cost leadership, Differentiation and Focus strategies Strategic Analysis and choice The input, matching (TOWS, SPACE, BCG IE,& grand strategy matrix) and Decision stages (QSPM) of strategic analysis choice.

UNIT-4:

Strategic Implementation-nature of strategic implementation, policies, resouse allocation, managing conflicts, managing structure with strategy (functional structure, divisional structure, SBU), restructuring, Reengineering & E- engineering, managing resistance to change, strategic budget allocation, Human resource concerns while implementing Corporate culture & leadership-Leading the strategic execution process.

UNIT-5:

Strategy review evaluation and control-Nature of strategy evaluation, strategy-evaluation framework, measuring organizational performance, taking corrective actions. Levels of strategic control, contingency planning & auditing. Managing strategic change-process, determining need for change, styles and tactics of change management.

Text Books:

1. Fred.R.David Strategic Management-concepts & cases-Prentice Hall Publication

Reference Books:

1. Thomos L Wheelen and J D Hunger- Strategic Management
2. Hamel G and Prahalad C K - Competing for the Future

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Course Title: **Project Management**			Course Code: **SAFE05**
Credit: 3	L **3**	T **0**	P **0**
Year: **2nd**			Semester: **III**

Project management, then, is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements.

The role will oversee the divisional demand planning (forecasting and inventory) requirements process which is highly important in Value Chain. This is a hands-on position responsible for developing and executing Demand Plan and inventory plans that will enable the division to meet sales and service objectives. Collaboration with other members of the supply chain, sales, marketing, and customer support teams is paramount to achieve these sales and service objectives PERT & CPM, What is Capital budgeting Managerial economics how Global SCM in Business, GST

- Projects
- PERT & CPM
- Capital budgeting
- Managerial economics
- Global SCM in Business and GST
- Auction mechanism
- Exercise

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Course Title: **Strategic & Operational Issues in Supply Chain Management**			Course Code: **SAFE06**
Credit: 3	L **3**	T **0**	P **0**
Year: **2nd**			Semester: **III**

The course helps students to understand the Sourcing & Purchasing, SCM strategies its Production and Supply Chain Strategy Distribution & Supply Chain Strategy what is Master Scheduling. How we can calculate the Aggregate Planning what is the role of Material Requirement Planning in SCM why Inspection & Quality Control helps in SCM, What are the Types of Contracts in Sourcing & Purchasing ,Describing Procurement in detail with latest methods, what is Decision Support System and why it is essential in SCM, what is Data Mining & Warehousing , DBMS in detail.

- Sourcing & Purchasing, SCM Strategy
- Production and Supply Chain Strategy
- Distribution & Supply Chain Strategy
- Master Scheduling
- Aggregate Planning
- Material Requirement Planning
- Inspection & Quality Control
- Types of Contracts in Sourcing & Purchasing
- Procurement in detail with latest methods
- Decision Support System
- Data Mining & Warehousing DBMS in detail

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Course Title: **Supply Chain Performance Metrics & Modeling**	Course Code: **SAFE07**		
Credit: 3	L **3**	T **0**	P **0**
Year: **2nd**			Semester: **III**

In this course you will able to understand what is Planning Supply & Demand in Supply Chain and Supply Chain Metrics, What are the models involved in Supply Chain Modeling and Simulation. What is forecasting, Analytical approach to Inventory Management (eg. Multi – Echleon Model), Algorithms in Supply Chain Planning Performance Measurement in SCM – Reverse Logistics.

- Planning Supply & Demand in Supply Chain
- Supply Chain Metrics
- Supply Chain Modelling and Simulation
- Forecasting – in detail with 'n' numbers of numerical problems
- Analytical approach to Inventory Management (eg. Multi – Echleon Model)
- Algorithms in Supply Chain Planning
- Performance Measurement in SCM – Reverse Logistics

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Course Title: **Digital and Social Media Marketing**	Course Code: **GAC620**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III**

UNIT-1:
INTRODUCTION TO DIGITAL MARKETING

Digital Marketing Fundamentals – Definition, Different Terminologies (E-marketing, online marketing, web marketing, internet marketing), key constituents of Digital Marketing, scope of Digital marketing (Applications), Digital Marketing Plan, Concept of e-Business & e-commerce, Revenue or Business Models

Digital Marketing Revolution -Historical evolution of Internet, Changing face of media & Impact of Digital Channels, Digital Marketing Industry

Digital Marketing Environment - Political, Economic, Socio-cultural, Technological, Ethical and Legal Issues: Ethical codes, Privacy issues, Digital Property (Patents, Copyright, Trademarks, licenses), Different types of online payment modes, E-Security –Firewalls,

UNIT-2:
DIGITAL MARKETING STRATEGY

Digital Marketing Research - Data Driven strategy, Electronic Marketing information Systems, monitoring Social Media, Web Analytics tools

Online Consumer Behviour – Customer Personas, Online Consumer Behviour models, Online exchanges and outcomes.

Segmentation, Targeting and Positioning (STP) – three markets (Business, Government, Consumer), Segmentation bases (Geographic, Demographic, Psychographic, Behavioural), Targeting Online Customers, Differentiating and positioning Online

UNIT-3:
DELIVERING THROUGH DIGITAL MARKETING

Conceptualizing and Developing a Website – conceptualizing online Product (benefits, attributes, branding etc.), Researching Site User's requirement (Usability, Web Accessibility, and Localization), Reviewing Competitors' website, designing the information architecture, Website Prototyping, Domain Name registration, hosting a website.

Introduction to Website designing tools – Website designing editors (HTML, Dreamweaver 8), elements of site design, site design and structure, Page design, Content Design, Testing of Content, Other standardized website designing free resources (Google sites, blogs, Webs etc.)

Pricing and Distribution of Digital Offer.

UNIT-4:
DIGITAL MARKETING COMMUNICATION TOOLS

Integrated Marketing Communication (IMC), IMC tools, Differences in Advertising through traditional & Digital Media, Setting Online Marketing objectives - Conversion Marketing Objectives, Timescales for Objective setting, Campaign Cost Objectives

Online Promotion Techniques –

a) Search Engine Marketing - Search Engine optimization, Pay-per-click, Search Engine Marketing, Introduction to Google Adwords, Google Adsense
b) Interactive Advertising - Fundamentals and Purpose, Measurement, Interactive Ad targeting options, Interactive Ad formats, Making banner ads work, Buying Advertising
c) E-mail Marketing – Opt-in e-mail options for customer acquisition, Opt-in email options for Prospect Conversion and Customer retention(house list), Key success factors, Inbound e-mail communication
d) Online Public Relations
e) Online Partnerships - affiliate Marketing, Online sponsorship
f) Marketing using videos on Youtube, facebook etc.
g) Viral Marketing

UNIT-5:

MARKETING THROUGH SOCIAL MEDIA

The Horizontal Revolution, Strategic Planning with Social Media, The **four zones of social media**- Social Consumers, Social Communities , Social Publishing, Social Entertainment, Social Commerce, Creating and analyzing business pages on social networking sites such as Facebook, Twitter, LinkedIn, Google+, role of Virtual communities and blogs, Social Media for Consumer Insight, Social Media Metrics, **Maintaining And Monitoring The Online Presence,** Defining Performance Metrics framework, Tools and techniques for collecting metrics and summarizing results, The Maintenance Process, Content Management Process.

Text Books & Reference Books

1. e-Marketing: Strass, El-Ansary, Frost
2. Social Media Marketing: Strategies for Engaging in Facebook, Twitter & Other Social Media by Liana Li Evans, Pearson Publication.
3. Social Median Marketing Book; By Dan Zarrel, O'Reilly Media.2009.
4. Digital Marketing: Strategy, Implementation and Practice, 5/E, Dave Chaffey, Pearson.

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Course Title: **Data Analytics Fundamentals**	Course Code: **GAC6620**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III / IV**

Unit 1: Overview of Analytics

What is analytics?, Types of problems in analytics, Case studies of application of analytics in business, When analytics does not work, Analytics vs. data warehousing, OLAP, Statistics, Widely used analytic software, Companies using analytics, Day in the life of a business analyst, Career path in analytics, Qualities of a business analyst

Unit 2: Statistics

Introduction to statistics, Summary statistics (Mean, Median, Mode, Variance), Probability, Probability distribution (Binomial, Poisson, Normal), Hypothesis testing, T-test, Chi-square test, ANOVA, Non parametric testing

Unit 3: Models and Algorithms

Modeling Terminology, Linear Regression, Logistics Regression, Decision Trees, MARS, Rule Induction, K-nearest, Neural Network, Genetic Algorithm

Unit 4: Analytic Methodology

Problem definition, Data selection, Data exploration, Data partition, Data cleansing, Data transformation, Modeling, Validation, Deployment, Assessment, re-start

Unit 5: Data Preparation

Why data preparation, Outlier treatment, Missing values treatment, Categorical variables, Dummy variables, Derived variables, Lag variables, Interaction variables, Variable transformation, Quadratic variables, Date, time variables, Sampling and partitioning, Preliminaries.

Unit 6: Data Analysis Techniques

Correlations, **Regression** (Basics of Regression, Linear Regression, Logistic Regression, Interpretation of modeling results, Violation of regression assumptions, **Decision Trees** (What are decision trees, Examples of trees, Terminology in decision trees, Data preparation for trees, How to create a tree? Measure of effectiveness (Gini, Chi-square, Information gain, Reduction in variance, Use of decision trees, when to use Decision trees? Widely used software for Decision trees, **Clustering (**What is clustering? types of clustering, K-means clustering, Measures of homogeneity, Data preparation, Hierarchical clustering, Cluster evaluation, Cluster profiling, When to use, Important considerations, **Pitfalls to avoid while modeling** (Misleading patterns, Biased population, Data at wrong level

Text Books:

1. R N Prasad and Seema Acharya, Fundamentals of Business Analytics, Wiley India.

Reference Books:

1. Minelli (2013), Big Data,Big Analytics: Emerging Business Intelligence and Analitic trends for today's business,2nd Edition ,Wiley India.
2. Levin and Rubin, (2013), Stastics for Management , 7th edition, Pearson Publication
3. Hair and Anderson(2013), Multivariate Data Analysis, 6th edition, Pearson Publication

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Course Title: **Summer Internship on Supply Chain & Seminar**			Course Code: **SAFE08**
Credit: 2	L	T	P
	0	**0**	**4**
Year: 2nd			Semester: **III**

After 2nd semester, it is mandatory that students are required to undergo a 6-8 weeks summer internship in a SAFEXPRESS or any one of their partner companies dealing in Logistics and supply chain domain. The training needs to be arranged Safeducate only. The purpose of such an internship is to give a students a chance to see the corporate world and it working through hands on sessions. Based their experience and training, students will be submitting a report in 3rd semester and same will be evaluated through viva-voce.

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Course Title: **Industrial Visit**	Course Code: **GAC4100**
Credit: 1	L T P **0 0 0**
Year: 2nd	Semester: **III**

To give first hand exposure and beyond books knowledge, all students will be mandatorily required to go on 4-7 days industrial tour.

Course Title: **On the Job Training**	Course Code: **SAFE09**
Credit: 12	L T P **0 0 0**
Year: **2nd**	Semester: **IV**

In this students will be given an opportunity to do On-the-Job training for full semester in 4th sem by Safeducate . It is highly likely that student will be given jobs on the basis of good performance thereafter.

Course Title: **Project Based on OJT**	Course Code: **SAFE10**
Credit: 12	L T P **0 0 0**
Year: **2nd**	Semester: **IV**

Based on On the Job training for full semester, students shall be required to submit a project report showcasing the training they got and same will be assessed through submission of the report.

Course Title: **Comprehensive Viva-Voce**	Course Code: **GAD180**
Credit: 1	L T P **0 0 0**
Year: **2nd**	Semester: **IV**

Students shall have appear in a comprehensive viva voce exam in which they will be assessed on the knowledge gained in semester III and IV.

DIT UNIVERSITY

Dehradun

COURSE STRUCTURE & SYLLABUS

OF

MCA (Lateral Entry)

BATCH 2016–18

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Year: 2nd **Semester: III**

Course Code	Course Title	L	T	P	Credit
KAC210	Unix & Shell Programming	3	0	2	4
KAC220	Database Management Systems	3	0	2	4
KAC230	Object Oriented Concepts with Java	3	0	2	4
KAC010	Design and Analysis of Algorithms	3	1	0	3.5
KAC020	Computer Organization and Architecture	3	0	0	3
KAC030	Combinatorics and Graph Theory	2	1	0	2.5
KAC110	Soft Skills Development	0	0	2	1
KAC120	Advance Web Applications	0	0	2	1
KAC310	Aptitude Building–I	0	0	2	1
	Total				**24**

Year: 2nd **Semester: IV**

Course Code	Course Title	L	T	P	Credit
KAD210	Advance Java	3	0	2	4
KAD220	Computer Graphics & Animation	3	0	2	4
KAD010	Microprocessor and System Design	3	1	0	3.5
KAD020	Theory of Computation	2	1	0	2.5
	Elective-I	3	1	0	3.5
	Elective-II	3	1	0	3.5
KAD310	Aptitude Building–II	0	0	2	1
KAD320	Value Added Training	0	0	2	1
KAD410	Industrial Tour	0	0	2	1
	Total				**24**

List of Elective Subjects for IV Semester

Elective – I	
KAD610	Advance Database Management Systems
KAD620	Data Compression & encryption
KAD630	Data Warehouse & Data Mining
KAD640	Distributed Database Systems

Elective – II	
KAD650	Artificial Intelligence
KAD660	Advance Computer Networks
KAD670	Cryptography and Network Security
KAD680	Parallel Computing

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Year: 3rd **Semester: V**

Course Code	Course Title	L	T	P	Credit
KAE210	.Net Framework and C# Programming	3	0	2	4
KAE010	Mobile and Adhoc Computing	3	1	0	3.5
KAE020	Cloud Computing	3	0	0	3
	Elective –III	3	1	0	3.5
	Elective-IV	3	1	0	3.5
	Elective-V	3	1	0	3.5
KAE110	Project	0	0	2	1
KAE120	MATLAB	0	0	2	1
KAE510	Industrial Training Presentation*	0	0	2	4
	Total				**27**

**During Summer Term after IV semester, students are compulsorily required to attend Industrial Training of 6-8 weeks which will be evaluated in V semester under Industrial Training Presentation.*

List of Elective Subjects for V Semester

Elective – III (*Choose any **one*)**	
KAE610	Principles of Compiler Design
KAE620	Real Time and Embedded Systems
KAE630	Operations Research
KAE640	Modeling & Simulation

Elective – IV (*Choose any **one*)**	
KAE650	Wireless Sensor Networks
KAE660	Fault Tolerance Computing
KAE670	Big Data Analysis
KAE680	Digital Image Processing

Elective – V (*Choose any **one*)**	
KAE690	Multimedia Systems
KAE600	Ethical Hacking
KAE6A0	Genetic Algorithm and Neural Networks
KAE6B0	Fuzzy Systems

Year: 3rd **Semester: VI**

Course Code	Course Title	L	T	P	Credit
KAF810	Industrial Project (Project Report & Comprehensive Viva-voce)	One semester			16
	Total				**16**

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Evaluation Scheme for the following Courses will be as under:

Course	Evaluation Scheme (%)				
	Attendance	Test-1	Test-2	Final Test	**Total**
Aptitude Building-1	10	30	30	30	100
Aptitude Building-2	10	30	30	30	100
Value Addition Training	10	30	30	30	100
Soft Skills	10	30	30	30	100

Summary of Credits

Year	Semester	Credit	Year Credit
First Year	**-**	**-**	**-**
	-	**-**	
Second Year	**III**	**24**	**47**
	IV	**23**	
Third Year	**V**	**27**	**43**
	VI	**16**	
Total Credits			**90**

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Course Title: **Unix and Shell Programming**	Course Code: **KAC210**
Credit: 4	L **3** T **0** P **2**
Year: **2nd**	Semester: **III**

Objectives: Objective of this course is to acquaint the students with the basics of unix operating system and shell programming. This course makes aware the students that how the operating system works. It also gives an idea about system administration.

Prerequisites: Operating System

UNIT-I

Introduction to UNIX operating system : History, characteristics of UNIX operating system, System structure – user perspective, Operating system services, kernel architecture, UNIX Shell, types of shell, utilities in UNIX, Notation of UNIX command, general purpose commands, commands for file system, process management and administrations, UNIX directory hierarchy.

UNIT-II

UNIX Shell Programming: Shell types and Shell features: standard streams, redirection, pipes, Command execution process.

Shell variables: predefined variables and user defined variable, environmental variables Writing scripts: basic concept, expression, decision and repetition, Special parameters, variables and argument processing Filter utilities: head, tail, cut, paste, tr, sort, uniq, wc, comm, diff, grep and awk utilities.

UNIT-III

The UNIX file system : The file system structure, type of files, Internal representation of files: inodes, structure of a regular file. Directories, conversion of path name to an inode, inode assignment to new file, allocation of disk blocks, System calls for the file system: open, read, write, adjusting, position of the file I/O, close, file creation, creation of special files, change directory, change root, change owner and change mode, stat and fstat etc.

UNIT-IV

The UNIX Process Management: The structure of processes, process states and transition, Layout of system memory, the context of process, manipulation of process address spaces, Process control: process creation, process termination, Awaiting process termination, Invoking other programs, User id of a process, System boot and init process, Login process and the shell process.

UNIT-V

Introduction to System Administration: Define system Administration, Booting the system, Maintaining User Accounts, File System, and special files, Backup and Restoration, introduction to Linux platform

Text Books:

1. Sumitabh Das, "**Unix Concepts and applications**", 4/e, Tata McGraw Hills, INDIA, 2008.
2. Yashwant Kanitkar, "**Unix Shell Programming**", 2/e, BPB, INDIA, 2009.

References Books

1. Saurabh, "**UNIX Programming: The First Drive**",3rd edition Wiley India,2010.
2. Johnson, **Beginning Shell scripting**, 1/e, Wiley, India 2010.
3. Mike Joy, Stephen Jarvis, Michael Luck, "**Introducing Unix and Linux**",1/e, Palgrave Macmillan,2010.

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List of Experiments (Unix Lab)

1. use of general purpose commands: mkdir, cd, pwd, ls, cat, less, cp, mv, rm, man, input and output redirection(< and >),pipe (|), grep, chmod, passwd, ps, kill, gzip, tar, find.
2. Use Vi editor to create a file which contain some text. Correct typing errors during creation, Save the file & Logout of the file.
3. Open the file created in Exp 1, Add, Change, delete & Save the changes.
4. Use the cat command to create a file containing the following data. Call it mutable use tabs to separate the fields 1425 ravi 15.65, 4320 ramu 26.27, 6830 sita 36.15, 1450 raju 21.86.
5. Use the cat command to display the content of file, use vi command to correct any errors in the file, use the sort command to sort the file according to the first field. Call the sorted file & print the file
6. Use the cut & paste commands to swap columns of file.
7. Use the date and who commands in sequence? (in one line) such that the output of date will display on the screen and the output of who will be redirected to a file .Use the more command to check the contents of file.
8. Develop an interactive grep script that asks for a word and a file name and then tells how many lines contain that word.
9. Write A shell script that takes a command –line argument and reports on whether it is directory ,a file,or something else.
10. Write a shell script that accepts one or more file name as a arguments and converts all of them to uppercase, provided they exits in the current directory.
11. Write a shell script that determines the period for which a specified user is working on the system

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Course Title: **Data Base Management Systems**	Course Code: **KAC220**
Credit: 4	L **3** T **0** P **2**
Year: **2nd**	Semester: **III**

Objectives: Objective of this course is to introduce the data base management system. To introduce the server query language and designing the database for the system. It enable the students to generate the query and to the transaction of data to perform various task of the different management system, to deal with the transaction failure and concurrency control.

Prerequisite: None

UNIT-I

Introduction: History of Data base Systems, Database System Vs File System, Database System concepts and architecture, data models schema and instances, data independence, interfaces, Database Languages,DDL, DML, Overall Database Structure, data base Users and Administrator.ER model concepts, notation for ER diagram, Mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of An ER diagrams to tables, extended ER model, relationships of higher degree.

UNIT-II

Introduction to the Relational Model: Relational data model concepts, integrity constraints: entity integrity, Referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus **Introduction to SQL:** Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL Commands, SQL operators and their procedure, Tables, views and indexes, Queries and sub queries, Aggregate Functions, Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors in SQL.PL/SQL, Triggers and clusters

UNIT-III

Data Base Design & Normalization: Role of Normalization, Schema refinement, Problems Caused by redundancy, Functional dependencies, normal forms, first, second, third normal Forms, BCNF, inclusion dependencies, loss less join decompositions, normalization using FD, MVD, and JDs, Alternative approaches to database design

UNIT-IV

Transaction Processing Concepts: Transaction system, Transaction concepts : Transaction execution and Problems, Transaction execution and control with SQL, Transaction properties, Transaction log, testing of serializability, Serializability of schedules, Conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, Checkpoints, Deadlock handling– detection and resolution.

UNIT-V

Concurrency Control Techniques: Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multiversion Schemes, Need of Database backup, Database backup techniques, Types of Database failures, Recovery with concurrent transaction.

Text Books:

1. Silberschatz, Korth, **Data base System Concepts**, 6/e, McGraw hill, USA, 2011.

2. Elmasri Navate, **Fundamentals of Database Systems**,6/e, Pearson Education, India,2010

Reference Book:

1. C.J.Date, **Introduction to Database Systems**, 8/e, Pearson Education, India, 2003.

List of Experiments (DBMS Lab)

1. To implement Data Definition language
2. To implement Data Manipulation language
3. To implement Constraints
4. To implement Insert, Select commands, update and delete commands.
5. To implement SET OPERATORS (Union, Intersect, Minus).
6. To implement Nested Queries & Join Queries.
7. To implement GROUP functions (avg, count, max, min, Sum).
8. Write programme by the use of PL/SQL
9. To implement Views
10. To implement Triggers
11. To implement Cursors
12. Create FORMS and REPORTS

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Course Title: **Object Oriented Concepts with JAVA**	Course Code: **KAC230**
Credit: 4	L **3** T **0** P **2**
Year: **2nd**	Semester: **III**

Objectives: Java plays a predominant role in software development it is felt that the following objectives can be achieved after studying this subject. Understand the concepts of Object oriented Programming which enables the student to write simple applications using Java and compare and contrast features of Java.

Prerequisites: Fundamental programming knowledge in C.

UNIT- I

Introduction and Evolution of Java: Concepts of class, objects, encapsulation, polymorphism, abstraction, inheritance. Evolution of Java, Byte Code, JDK, JVM, JRE, Data types, Variables, Arrays, Operators, Operator precedence, associativity, object equality and reference equality, Command line arguments.

Control Statements: switch with Strings, for each loop.

Classes & Objects - Constructor, super() and this() constructor calls, constructor call hierarchy, Methods, this, super keyword, Inheritance, static blocks, multiple static block, instance initializer block, variable arity method.

UNIT-II

Packages: Defining Packages, Using Packages, import and static import, jar utility, classes modifiers: abstract, final; member modifiers.

Interface: Defining Interfaces, abstract methods declarations, implementing interfaces, extended Interfaces, interface references and constants in interfaces

Fundamental Classes: Object class, Wrapper classes, String class, immutability, String Buffer

UNIT-III

Exception handling: Exception Types, Exception class, Runtime Exception Class, Error Class, Defining new exceptions; Handling exceptions.

Thread: Overview of threads, thread Creation; implementing the runnable interfaces, extending the thread class, Thread States. Synchronized and static synchronized threads. Synchronized blocks.

UNIT-IV

The File class, Filename Filter, Byte Streams: Input and Output streams, Character streams: readers and writers; object serialization

Applet: Applet Life cycle; Event Handling: Event handling mechanisms, the Delegation Event Model, vent classes, sources of events, Event Listener Interfaces, Adapter classes

AWT: AWT Controls, Layout Managers, Frame, Images, Graphics, Fonts, Cursors, Colors, File Dialog box, Menus

Swing- Introduction**,** Advantages over AWT, Swing applications.

UNIT-V

Networking: Networking Basics, Java and the Net, TCP/IP Client sockets, URL, URL Connection, TCP/IP Server sockets, Datagram

Introduction to Generic Classes and Collection (List, Set, Map)

Text Books:

1. Herbert Schieldt, "**The Complete Reference: Java**",8/e, TMH,India,2006
2. E. Balagurusamy, "**Programming in JAVA:A Primer**", 4/e,TMH,India,2009

Reference Book:

1. Khalid A. Mughal – Rolf W Rasmussen, **A Programmer's guide to Java SCJP certification**, 3/e, Addison-Wesley,USA,2009

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List of Experiments (JAVA Lab)

1. Write a program in JAVA to be familiar with class, object, instance, reference, methods and fields.
2. Write a program in JAVA to show working of overloaded constructors and methods
3. Write a program in JAVA to show how to pass arrays to methods, also show that array are passed as references.
4. Write a program in JAVA to illustrate the working of for each loop, labeled break and labeled continue
5. Write a program in JAVA to illustrate exception handling. Show how exceptions can be caught and thrown, show the handling of checked and unchecked exceptions
6. Write a program in JAVA to show the significance of inheritance, this, super and overriding
7. Write a program in JAVA to illustrate the methods of String and StringBuffer
8. Write a program in JAVA to execute two loop simultaneously using threads
9. Write a program in JAVA using command line arguments to copy the contents of one file into another. Handle exceptions wherever necessary.
10. Using Applets or Frames develop the "Paint Brush" tool in Java. Compare with Paint Brush and exactly develop the same working only for free form sketching using a brush.
11. Develop a client server application using TCP/IP according to the following requirements.
    a. A client logs in by issuing a command **LOGIN@** followed by his/her name.
    b. As soon as a client logs in, server presents him/her with a list of all other clients which are online.
    c. A client logs out by issuing a command **LOGOUT**
    d. As soon as a client logs out, server presents an updated list of clients to all others which are online.

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Course Title: **Design and Analysis of Algorithms**	Course Code: **KAC010**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **2nd**	Semester: **III**

Objectives: Objective of this course is to study and analyse the algorithms. It provides us with the mathematical and technical approaches of solving problems in various ways. This course enables the students to design the algorithm to solve the problems and to find out the complexity of the program. It enables the students to check how the worst case complexity of an algorithm is defined.

Prerequisites: Data Structures

UNIT-I

Introduction: Algorithms, Pseudo code for expressing algorithms, Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, Introduction of Recurrences: Substitution, recursion tree and master method.

Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort Analysis of Insertion Sort, Trees: Binary Search Trees, Insertion and Deletion

UNIT-II

Dynamic Programming: Matrix Chain multiplication, Longest Common subsequence,0/1 knapsack problem, optimal binary search trees.

Greedy Algorithm: Activity Selection problem, Theoretical foundation of greedy algorithm, Task Scheduling problem, Comparison of dynamic programming and Greedy algorithm with Knapsack as case study.

UNIT-II

Branch and Bound: Traveling sales man problem, Linear programming.

Backtracking: General method, applications-n-queen problem, sum of subset problem.

UNIT-IV

Introduction to Graph Algorithm: BFS, DFS, Kruskal, Prim, Single source shortest path : Bellman Ford, Dijkstra's algorithm, All Pair Shortest Path, Floyd Warshall, Flow Networks, Residual Network, Augmenting Path, Ford Fulkerson method

UNIT-V

Introduction to Computational Geometry: Convex Hull, Graham Scan, Overview of NP Completeness, Introduction to various NP Complete problems-Vertex Cover Problem, Traveling Salesman Problem

Text Books:

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest, and C.Stein, **Introduction to Algorithms**, 2/e, PHI Pvt. Ltd./ Pearson Education, India, 2001
2. Ellis Horowitz, Satraj Sahni and Rajasekharam, **Fundamentals of Computer Algorithms**, 2/e, Galgotia Publications Pvt. Ltd, New Delhi India, 2007

Reference Books:

1. R.C.T. Lee, S.S. Tseng, Chang and T.Tsai, **Introduction to Design and Analysis of Algorithms: A strategic approach**, 2/e McGraw Hill, USA, 2007
2. Allen Weiss, **Data structures and Algorithm Analysis in C++**, 2/e , Addison Wesley,USA,1997
3. Aho, Ullman and Hopcroft **Design and Analysis of algorithms**, 4/e, Pearson education, India, 2009
4. Richard Johnson baugh and Marcus Schaefer **Algorithms**, 3/e, Pearson Education,India,2006

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Course Title: **Computer Organization and Architecture**	Course Code: **KAC020**
Credit: 3	L **3** T **0** P **0**
Year: **2nd**	Semester: **III**

Objectives: The objective of this course is to study the design options in computer architecture and organization. This course also includes functional units of the PC, basic working of CPU, memory organization and I/O device etc.

Prerequisites: Fundamental of Computers Systems and Digital Electronics

UNIT-I

Register Transfer Language, Bus and Memory Transfers, Bus Architecture, Bus Arbitration, Arithmetic Logic, Shift Micro-operation, Arithmetic Logic Shift Unit, Design of Fast address, Arithmetic Algorithms (addition, subtraction, Booth Multiplication), IEEE standard for Floating point numbers.

UNIT-II

Control Design: Hardwired & Micro Programmed (Control Unit): Fundamental Concepts (Register Transfers, Performing of arithmetic or logical operations, Fetching a word from memory, storing a word in memory), Execution of a complete instruction, Multiple-Bus organization, Hardwired Control, Micro programmed control (Microinstruction, Microprogram sequencing, Wide-Branch addressing, Microinstruction with Next-address field, Prefetching Microinstruction).

UNIT-III

Processor Design: Processor Organization: General register organization, Stack organization, Addressing mode, Instruction format, Data transfer & manipulations, Program Control, Reduced Instruction Set Computer.

Input-Output Organization: I/O Interface, Modes of transfer, Interrupts & Interrupt handling, Direct Memory access, Input-Output processor, Serial Communication.

UNIT -IV

Memory Organization: Memory Hierarchy, Main Memory (RAM and ROM Chips), organization of 2D

and 21/2D, Auxiliary memory, Cache memory, Virtual Memory, Memory management hardware.

UNIT-V

Introduction to parallel processing– Pipelining, , Architectural classification schemes. Principles of pipelining & Vector processing – Principles of Linear pipelining, Classification of pipeline processors, General pipelines and reservation tables, interleaved memory Organizations, Instruction and Arithmetic pipelines, Principles of designing pipelined processors, Vector processing Requirements. Structures for array processors: SIMD Array processor, SIMD Interconnection networks.

Text Books:

1. M. Morris Mano, **Computer System Architecture**,3/e , PHI/Pearson Education, India, 2006
2. Thomas C. Bartee **Digital Computer Fundamentals**,6/e ,Tata McGraw Hill,India, 2010 (RePrint)

Reference Books:

1. Vravice, Zaky & Hamacher ,**Computer Organization**, 5/e,TMH,INDIA,2010.
2. Tannenbaum, **Structured Computer Organization**, 6/e, Prentice Hall, 2013.
3. Stallings, **Computer Organization and Architecture**, 7/e, PHI, INDIA, 2009.
4. John P.Hayes, **Computer Architecture and Organization**,3/e, McGraw Hill, USA, 1998

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Course Title: **Combinatorics and Graph Theory**	Course Code: **KAC030**
Credit: 2.5	L **2** T **1** P **0**
Year: **2nd**	Semester: **III**

UNIT-I

Fundamental principles of counting - permutations and combinations - binomial theorem -combinations with repetition - combinatorial numbers - principle of inclusion and exclusion -derangements - arrangements with forbidden positions - Generating functions - partitions of integers -the exponential generating function - the summation operator - recurrence relations - first order and second order – non homogeneous recurrence relations - method of generating functions

UNIT-II

Graphs, sub-graphs, some basic properties, Walks, Path & circuits, Connected graphs, Disconnected graphs and component, Euler and Hamiltonian graphs, The traveling sales man problem, Various operation on graphs.

UNIT-III

Cut-sets and cut vertices, some properties, All cut sets in a graph, Fundamental circuit and cut sets, Connectivity and seperatability, Network flows, mincut theorem, Planar graphs, Combinatorial and geometric dual, Kuratowski to graph detection of planarity, Geometric dual, Some more criterion of planarity, Thickness and Crossings.

UNIT-IV

Vector space of a graph and vectors, basis vector, cut set vector, circuit vector, circuit and cut set verses subspaces, orthogonal vectors and subspaces, incidence matrix of graph, sub matrices of A(G), circuit matrix, cut set matrix, path matrix and relationships among Af, Bf, and Cf, fundamental circuit matrix and rank of B, adjacency matrices, rank- nullity theorem .

UNIT-V

Coloring and covering partitioning of graph, Chromatic number, Chromatic partitioning, Chromatic polynomials, Matching, covering, Four color problem.

Text Book

1. Grimaldi R. P., **Discrete And Combinatorial Mathematics: An Applied Introduction**, 5/e, Addison Wesley,USA,2006

Reference Books

1. Clark J. & Holton D. A., **A First Look at Graph Theory**, 1/e Allied Publishers (World Scientific), Singapore,2008 (RePrint)
2. Corman T. H., Leiserson C. E. & Rivest R. L., **Introduction to Algorithms**, 3/e, Prentice Hall, USA(MIT Press),2009
3. M ott J. L., Kandel A. & Baker T.P., **Discrete Mathematics for Computer Scientists And Mathematicians**, 2/e, Prentice Hall of India,1999
4. Liu C. L., **Elements of Discrete Mathematics**, 3/e, McGraw Hill, Singapore,2008
5. Rosen K. H., **Discrete Mathematics and Its Applications**, 7/e, McGraw Hill, Singapore,2011

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Course Title: **Advance Web Applications**	Course Code: **KAC120**
Credit: 1	L **0** T **0** P **2**
Year: **2nd**	Semester: **III**

HTML: Basic HTML structure, Basic HTML formatting tags, Links and site structure, Tables, Forms

CSS: Style Sheet basics. Working with CSS files, Style Selectors. Formatting with Styles

XML: XML Basics, element, attributes, CDATA, XSL and DTD, XSL transformations and programming, XML parsers, XML in Content management, XML in Web Services, XML in data transfer, RSS feed

DOM parsing using Javascript: HTML & XML DOM, Node, Element, inner HTML, Node attributes and values

AJAX: XML Http Request Object, GET and POST request, Function for handling the response, AJAX libraries, AJAX applications

Comet (Reverse AJAX): Introduction, Problems with HTTP protocol, Two way web (persistent connection), Long polling, Application in chatting and others

JQuery: Cross browser javascript compatibility issue, Introduction to JQuery, JQuery selectors, DOM, Events, JQuery and AJAX, UI, Animation and Effects using JQuery

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Course Title: **Advanced Java**	Course Code: **KAD210**
Credit: 4	L **3** T **0** P **2**
Year: **2nd**	Semester: **IV**

Objectives: To develop proficiency in object oriented methodology. To get a good understanding of professional programming applications and to develop a base for advanced computer science study.

Prerequisites: Any programming language like C, C++

UNIT-I

JDBC: Concept of JDBC, JDBC Driver Types, JDBC Packages, Database Connection, Associating the JDBC/ODBC Bridge with the Database, JDBC URL, Statement Objects, ResultSet, Transaction Processing, commit, savepoint, rollback, ResultSetMetadata, DatabaseMetadata, Data Types, SQLException, Prepared Statement, Callable Statement, Batch updates.Storing and Retrieving images via JDBC. Connection pooling.
Establing connection with **Oracle, MySQL, MSSQL, MS Access and MS Excel**

UNIT-II

Servlets: Advantages of Servlets over CGI, Installing Servlets, The Servlet's Life Cycle, Servlet API, Handling HTTP GET and POST Request, ServletConfig, ServletContext, Requests and Responses, GenericServlet, HttpSevlet, HttpServlet Request, HttpServletResponse, Deployment Descriptor, Request Dispatcher

UNIT-III

Session: Cookies, Session Tracking, Filter API, Multi-tier Applications Using Database Connectivity **Java Server Pages (JSP):** Problems with Servlets and Advantages of JSP, JSP Scripting Elements- (Directives, Declaratives, Scriplets, Expressions, Implicit Variables), Page Directives, Standard Action, expression language (EL), JSTL in detail, introduction to Custom Tags. **Java Beans:** Java Bean, Advantages, usebean and other tags, scope of beans.
A servlet/JSP based download/upload application.

UNIT-IV

Enterprise Java Beans: EJB, benefits, EJB Architecture, EJB Roles, Types of EJB, Building small session bean application, Home Interface, Remote Interface, Session bean: stateless, stateful session bean. **Struts:** Struts Archietecture, Benefits of struts, MVC, control flow, Struts- Config.xml, web.xml, Action Forward, Action Form, Action Mapping, ActionServlets, validation framework in detail, Building a small Struts application.

UNIT-V:

XML parsing through Java: SAX parser and DOM parser
Ant: What are Build Tools? Advantages of ANT, Installation and usage
Hibernate: Object Relational Mapping, Advantages over JDBC, Mapping from Java classes to database tables (and from Java data types to SQL data types), Data query, retrieval and manipulation.

Text Books:

1. Jassica Burdman, **Collaborative Web Development**, 1st Edition, Addison Wesley, UK, 1999.
2. Allamaraju and Buest, Professional JAVA Server Programming, Latest Edition, SPD Publication, India,
3. Ivor Horton, Beginning J2EE 1.4, Latest Edition, SPD Publication.

Reference Books:

1. Krishnamoorthy & S. Prabhu, Internet & Java Programming, Latest Edition, New Age Publication.
2. Austin and Pawlan, Advanced Programming for JAVA 2 Platform, Latest Edition, Pearson Publication.
3. Chris Bates, Web Programming Building Internet Applications, 2nd Edition, WILEY Dreamtech publication, India, 2006.

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List of Experiments (Advanced Java Lab)

1. Establish connection to your local MySQL Database, create a table and insert few records.
2. Try creating a connection to a variety of databases – MySQL, Oracle, Microsoft SQL Server, MS Access, MS Excel e.t.c
3. Using **execute()** method execute a SELECT statement and traverse the rows by obtaining **ResultSet** from the **getResultSet()** method
4. A table "Employee" contains a field "children", if an employee has no children the getInt() method returns zero (0), it also returns zero (0) when the field contains NULL. Write a program to show how to distinguish between 0 and NULL
5. Write a program to implement two methods which depict the working of inbuilt methods **absolute()** and **relative()**
6. Write a program to show the working of following methods next(), previous(), first(), last(), beforeFirst(), afterLast(), absolute(), relative(), isFirst(), isLast(), isBeforeFirst(), isAfterLast(), getRow()
7. Execute a SELECT statement which retrieves all columns e.g. SELECT * FROM <table-name>, write a program to print the total number of rows, columns and name of each column in the **ResultSet**
8. Create a connection to database and print all tables in it.
9. Oracle and MS Access are not compatible with each other. Write an application which create connection to Oracle and export data from a database then imports that data into a MS Access database.
10. Implement the Servlet interface and present user a form to enter roll number of a student. The form should be submitted to another Servlet where it establishes connection to a database and retrieves the marks and name of the student. Show error message if roll number is invalid.
11. Create a Servlet by extending the HttpServlet class and solve the above problem definition using only one Servlet i.e. present the form in the doGET method and display name and marks in the doPOST method.
12. Write a JSP to show the working of all four scripting tags.
13. Write a JSP to show the working of errorPage and isErrorPage i.e. exceptions generated in a JSP must be handled by specified error page JSP.
14. Write a JSP to show the working of jsp: forward, jsp:include and include directive.
15. Using jspInit method and implicit objects write a JSP to prompt user to enter last name of a student and display a list of students matching that last name, each name should be a hyperlink which should display the detail of student. **Note**: Connection should be established only once.
16. Segregate the presentation logic and business logic by using beans along with JSP and solve the same roll number and marks problem as in Q.14. Connection should be established in bean and only once. JSP should be not contain any business logic.
17. Develop an application like picassa using servlets/jsp which have a feature of login (using session and cookies) and user can upload and download pictures. Use JSTL and expression language where ever necessary.
18. Develop a struts and hibernate chat server application where chat history are stored and can be retrieved.
19. Develop a struts based application to demonstrate the working of validation framework.

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Course Title: **Computer Graphics and Animation**	Course Code: **KAD220**
Credit: 4	L **3** T **0** P **2**
Year: **2nd**	Semester: **IV**

UNIT–I

Introduction and Line Generation: Types of Computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid-point circle generating algorithm, and parallel version of these algorithms.

UNIT-II

Transformations: Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing. Windowing and Clipping: Viewing pipeline, Viewing transformations, 2-D Clipping algorithms- Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against nonrectangular clip windows; Polygon clipping Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping.

UNIT–III

Three Dimensional: 3-D geometric primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.

UNIT–IV

Curves and Surfaces: Quadric surfaces, Spheres, Ellipsoid, Blobby objects, introductory concepts of Spline, Bspline and Bezier curves and surfaces. Hidden Lines and Surfaces: Back Face Detection algorithm, Depth buffer method, A- buffer method, Scan line method, basic illumination models – Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.

UNIT–V

Computer Animations : Conventional and computer assisted animation, design of animation sequences, interpolation, simple animation effects, animation languages (Key Frame System, Parameterized systems), motion specifications, methods of controlling animation.

Text Book:

1. D. Hearn and M.P. Baker, Computer Graphics, C Version, Lates Edition, Pearson Education, 2002.

Reference Books:

1. D. Hearn and M.P. Baker, Computer Graphics with OpenGL Version, 3rd edition, Pearson Education, 2004.
2. James D. Foley, A. Van Dam, S.K. Feiner, and J.F. Hughes, Computer Graphics: Principles and Practice, 3rd edition, Addision-Wesley Publishing Company, 2014.
3. Z. Xiang, R. Plastock, Schaum's outlines Computer Graphics, 2nd Ed., TMH,
4. W. M. Newman, R. F. Sproull, Principles of Interactive computer Graphics, Latest Edition, TMH.
5. D. F. Rogers, J. A. Adams, Mathematical Elements for Computer Graphics, 2nd Ed., TMH
6. Rogers B., Mathematical Elements of Computer Graphics, Latest Edition, Tata McGraw Hill, 2002

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List of Experiments (Computer Graphics Lab)

1. Implementation of line generation using slope's method, DDA and Bresenham's algorithms.
2. Implementation of circle generation using Mid-point method and Bresenham's algorithm.
3. Implementation of ellipse generation using Mid-point method.
4. Implementation of polygon filling using Flood-fill, Boundary-fill and Scan-line algorithms.
5. Implementation of 2D transformation: Translation, Scaling, Rotation, Mirror Reflection and Shearing (write a menu driven program).
6. Implementation of Line Clipping using Cohen-Sutherland algorithm and Bisection Method.
7. Implementation of Polygon Clipping using Sutherland-Hodgman algorithm.
8. Implementation of 3D geometric transformations: Translation, Scalind and rotation.
9. Implementation of Curve generation using Interpolation methods.
10. Implementation of Curve generation using B-spline and Bezier curves.
11. Implementation of any one of Back face removal algorithms such as

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Course Title: **Microprocessor and System Design**	Course Code: **KAD010**
Credit: 3.5	L **3** T **1** P **0**
Year: **2nd**	Semester: **IV**

UNIT-I

Introduction to Microprocessors, microcomputers and Assembly language, Microprocessor architecture and microcomputer systems. 8085 architecture and memory interfacing, Interfacing I/O devices.

UNIT-II

Programming 8085: Introduction to 8085 Instructions: Programming Techniques, Counters and Time Delays, Stacks and Subroutines, Interrupts, General purpose programmable peripheral devices

UNIT-III

Introduction to system software: definition, feature of system programming, system programming vs. application programming and type of system programmes.Assembler: single pass assembler, two-pass assembler, and general design procedure of an assembler.

UNIT-IV

Macro processor: macro language and its features, macro instructions, features of macro facility, implementation, one pass macro processor, two pass macro processor, Implementation.

Loaders and linkers: simple linker vs. loaders, and design and implementation of direct linking loader, subroutine linkage & other loader schemes

UNIT-V

Compilers: overview of compilation process, lexical analysis, syntax analysis, semantic analysis and intermediate code generation and code optimization techniques, compiler vs. interpreter. Introduction to device driver, functions and structure of text editor.

Text Books:

1. John J Donovan ,"Systems Programming", 10/e,McGraw-Hill Edition ,USA,2010,

Reference Books:

1. R.S Goankar, "Microprocessor architecture, programming and application with the 8085",5/e, PenRam International,India,2011

2. Aho and Ulman, "Principles of Compilers", 2/e, Narosa Publishing House, India, New Delhi,2006

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Course Title: **Theory of Computation**	Course Code: **KAD020**
Credit: 2.5	L **2** T **1** P **0**
Year: **2nd**	Semester: **IV**

UNIT-I

Introduction to defining language, Kleene Closure, Arithmetic expressions, Chomsky Hierarchy, Regular expressions, Generalized Transition graph. Finite Boolean algebra, functions of Boolean algebra. Conversion of regular expression to Finite Automata, NFA, DFA, Conversion of NFA to DFA, Optimizing DFA, FA with our Moore machine, Mealy machine, Conversions.

UNIT-II

Regular expressions and finite Automata: Regular languages, Finite automata, Union, Intersections & complements. Non deterministic Finite automata, Kleene's theorem. Regular & Non regular languages: Criterion for regularity, minimal Finite Automata, Pumping lemma, Decision problems, languages & computers.

UNIT-III

Context-free grammars: Derivation Trees & Ambiguity, An Unambiguous CFG for algebraic expressions, simplified forms and normal forms. Pushdown Automata: Definition, Deterministic pushdown automata, A PDA corresponding to a given context-freegrammar, context-free grammar corresponding to a given PDA, parsing.

UNIT-IV

Context-free and Non-Context-free languages: The pumping lemma for context-free languages, Intersections & complements of context-free languages, decision problems involving context-free languages.

UNIT-V

Turing Machines: Definitions, computing partial functions, combining Turing machine, variation of Turing machines, Non-Deterministic Turing Machines, Universal Turing Machine

Text Books:

1. John C Martin, Introduction to languages & the theory of computation by, 3rd edition, Tata McGraw Hill publication, 2004.
2. John E. Hopcroft and Jefrey D Ullman, Introduction to Automata theory, Languages and Computation, Narosa Publication House, 2004.
3. K.L.P Mishra & N. Chandrasekharan, Theory of Computer Science, Latest Edition, PHI, 2006.

Reference Books:

1. Michael Sipser, Introduction to the Theory of Computation, 2nd edition, Thomson, 2008.
2. Bernard M. Moret, The Theory of Computation, Latest Edition, Pearson Education, 2014.
3. Dexter C. Kozen, Automata and Computability, Latest Edition, Springer, 2007.

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Course Title: **Advance Database Management Systems** ***(Elective-I)***	Course Code: **KAD610**
Credit: 3.5	L **3** T **1** P **0**
Year: **2nd**	Semester: **IV**

UNIT-I

Distributed DBMS Concepts and design: Introduction, functions and architecture of a DDBMS, distributed relational database design, Transparencies in a DDBMS, Twelve rules for a DBMS. Advanced concepts: Distributed transaction management, distributed concurrency control, distributed deadlock management, distributed database recovery, X/open distributed Transaction processing model, Replication servers, Distributed query optimization, Mobile databases.

UNIT-II

Object-Oriented DBMS Introduction, advanced database applications, weakness of RDBMS, storing objects in a relational database, next-generation database systems. Concepts and design: OODBMS perspectives, persistence, issues in OODBMS, advantages and disadvantages of OODBMS, Object- oriented database design.

UNIT-III

Standards and systems: object management group, object database standard ODMG 3.0 1999, Object store. Object relational DBMS: Introduction, third generation database manifestos, SQL8, Object oriented extensions in Oracle, Comparison of ORDBMS and OODBMS.

UNIT-IV

Web technology and DBMS, Web as a database Application Platform: Requirements for web-DBMS integration, web-DBMS architecture, advantages and disadvantages of web-DBMS approach, approaches to integrating the web and DBMS, Oracle Internet Application Server (IAS).

Text Books:

1. Shio Kumar Singh, Database Systems: Concept Design and Applications, 1/e, Pearson Education, India,2011

Reference Books:

1. Bipin C Desai, An Introduction to Database Systems,2/e, West Publishing Company, USA, 1997
2. Carlo Zaniolo, Stefano Ceri, "Advanced Database Systems", Morgan Kaufmann, USA 1997

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Batch 2016-18

Course Title: **Data Compression and Encryption** ***(Elective-I)***	Course Code: **KAD620**
Credit: 3.5	L **3** T **1** P **0**
Year: **2nd**	Semester: **IV**

UNIT-I

Need for Data Compression, Lossy/ lossless compression, symmetrical compression and compression ratio, run length encoding (RLE) for text and image compression, relative encoding and its applications in facsimile data: compression and telemetry, scalar quantization. Statistical modeling of ingormation source, coding redundancy, variable size codes prefix codes, Shannon-Fano coding, Huffman coding, adaptive Huffman coding, arithmetic coding a adaptive arithmetic coding, text compression using PPM method.

UNIT-II

String compression, sliding window compression, LZ77, LZ78and LZW algorithms and applications in text compression, Zip and Gzip, ARC and Redundancy code.Loss less techniques of image compression, gray codes, two dimensional image transform, discrete cosine transform and its application in lossy image compression, quantization, zig-zag " coding sequences, JPEG and JPEG-LS compression standards, pulse code modulation and differential pulse code modulation methods of image compression, video compression and MPEG industry standard.

UNIT-III

Digital Audio, Lossy sound compression, M-Iaw and A-law compounding, DPCM and ADPCM audio compression, MPEG audio standard, frequency domain coding, format of compressed data.

UNIT- IV

Security of information, security attacks, classical techniques, Caesar cipher, block ciper principles,

data encryption standard, key generation for DES, block cipher principle, design and modes of operation, S-box design, triple DES with two three keys, introduction to international data encryption algorithm, key distribution.

UNIT -V

Number Theory and public encryption: Modular arithmetic, Fermat's and Euler's theorems, Chinese remainder theorem, discretelogarithm, principles of public key cryptosystems, RSA algorithm, key management, Diffie-Hellman key exchange, elliptic curve cryptography.

Text Books:

1. Khalid Sayood, Introduction to Data Compression,3/e, Morgan Kaufmann Publication,USA,2005

Reference Books:

1. David Salomon, Handbook of Data Compression, 5/e, Springer Verlag Publication, USA, 2010

2. Mark-Nelson, The Data Compression Book, 2/e, M & T Books, USA, 1996

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Course Title: **Data Warehousing and Data Mining** ***(Elective-I)***	Course Code: **KAD630**
Credit: 3.5	L T P **3 1 0**
Year: **2nd**	Semester: **IV**

UNIT-I

Dss-Uses, definition, Operational Database. Introduction to Data Warehousing. Data-Mart, Concept of Data-Warehousing, Multi-Dimensional Database Structures. Client/Server Computing Model & Data Warehousing. Parallel Processors & Cluster Systems. Distributed DBMS implementations.

UNIT-II

DATA Warehousing. Data Warehousing Components. Building a Data Warehouse. Warehouse Database. Mapping the Data Warehouse to a Multiprocessor Architecture. DBMS Schemas for Decision Support. Data Extraction, Cleanup & Transformation Tools. Metadata.

UNIT-III

Business Analysis. Reporting & Query Tools & Applications. On line Analytical Processing(OLAP). Patterns & Models. Statistics. Artificial Intelligence.

UNIT-IV

Knowledge Discovery, Data Mining. Introduction to Data-Mining. Techniques of Data-Mining. Decision Trees. Neural Networks. Nearest Neighbor & Clustering. Genetic Algorithms. Rule Introduction. Selecting & Using the Right Technique.

UNIT-V

Multimedia Data-Mining, Multimedia-Databases, Mining Multimedia Data, Data-Mining and the World Wide Web, Web Data-Mining, Mining and Meta-Data. Data Visualization & Overall Perspective. Data Visualization. Applications of Data-Mining.

Text Books:

1. Alex Berson, Data Warehousing, Data Mining & OLAP, 13(Reprint), TMH, India, 2008

Reference Books:

1. Margaret H. Dunham, "Data-Mining. Introductory & Advanced Topics", 3/e, Pearson Education, India, 2008

2. Jiawei Han, Micheline Kamber, Data Mining: Concepts and Technique, 2/e, Morgan Kaufmann, USA, 2001

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Course Title: **Distributed Database Systems** ***(Elective-I)***	Course Code: **KAD640**
Credit: 3.5	L **3** T **1** P **0**
Year: **2nd**	Semester: **IV**

UNIT-I

Distributed Databases Distributed Databases: What and Why? ; the Distributed Database Management Systems. The Distributed Transparency - - the Reference Architecture for Distributed Databases, Data Fragmentation, Distributed Transparency for Read-Only and Applications, Distributed Database Access Primitives, Integrity Constraints in Distributed Databases.

UNIT-II

Distributed Database Design Framework for Distributed Database Design, the Database Fragmentation Design, Allocation of Fragments. Translation of Global Queries to Fragment Queries The Equivalence Transformation for Queries, Transforming Global Queries into Fragment Queries, Distributed Grouping and Aggregate Function Evaluation, Parametric Queries.

UNIT-III

Optimization Of Access Strategies Framework for Query Optimization, Join Queries - - use of Semi-Join Programs for Join Queries, the SDD-l Algorithm, the AHY approach, Use of Join as Query Processing Tactic; General Queries - - Effect of Commuting Joins and Unions, Methods for the Optimization of General Queries. The Management of Distributed Transactions The Framework for Transaction Management; Atomicity of Distributed Transactions; Concurrency Control for Distributed

Transactions; Architectural Aspects of Distributed Transactions.

UNIT-IV

Concurrency Control Foundations of Distributed Concurrency Control; Distributed Deadlocks; Concurrency Control based on Timestamps; Optimistic Methods for Concurrency Control. Distributed Database AdministrationCatalog Management in Distributed Databases, Authorization and Protection. The System R * The Architecture of System R*; Compilation, Execution and Recompilation of Queries; Protocols for Data Definition and Authorization in R*, Transaction and Terminal Management.

UNIT-V

The Object Oriented Databases Object Oriented Databases - What and Why? , the Object Oriented Database Management Systems; Evolution of Object Oriented Concepts; Characteristics of an Object Oriented Data Model; Object Schema; Inter- object Relationships; Late and Early Binding; Similarities and differences between object Oriented Database Models and other Data models. Object Oriented DBMS Architectural Approaches The Extended Relational Model Approach; Semantic Database Approach; Object Oriented Programming Language Extension Approach; DBMS Generator Approach; the Object Definition Language and the Object Query Language.

Text Books:

1. Distributed Databases - Principles and Systems; Stefano Ceri, Guiseppe Pelagatti; Tata McGraw Hill; 1985.
2. Database Systems- Design, Implementation and Management; Peter Rob, Carlos Coronnel; Course Technology; 2000.

Reference Books:

1. Principles of Distributed database systems by M.T. Ozsu/S. Sridhar, Pearson education
2. Database Management Systems; Raghu Rama Krishnan, Johnaas Gehrke; Tata McGraw Hill; 2000.
3. Fundamentals of Database Systems - Third Edition; Elmasri, Navathe; Addison-Wesley; 2002.

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Course Title: **Artificial Intelligence** *(Elective-II)*	Course Code: **KAD650**
Credit: 3.5	L **3** T **1** P **0**
Year: **2nd**	Semester: **IV**

Objectives: The course will cover basic ideas and techniques underlying the design of intelligent computer systems. Students will be able to develop the intelligent systems to reduce the human effort, and how the intelligence can be provided to a machine.
Prerequisites: None

UNIT-I

Introduction: History of AI, Intelligent agents and its functions, Problem spaces and search - Heuristic Search techniques – Best-first search, Problem reduction - Constraint satisfaction - Means Ends Analysis.

UNIT-II

Knowledge Representation: Approaches and issues in knowledge representation, Propositional Logic, Predicate logic – clause form conversion – Unification – Resolution, Semantic Nets, Partitioned Nets, Minskey frames, scripts.

UNIT-III

Reasoning under uncertainty: Logics of non-monotonic reasoning, Implementation, Basic probability notation, Bayes rule, Certainty factors and rule based systems, Bayesian networks, Introduction to Fuzzy Logic.

UNIT-IV

Planning and Learning: Planning with state space search, conditional planning, continuous planning, Multi-Agent planning. Forms of learning - inductive learning – Reinforcement Learning - learning decision trees - Neural Net learning and Genetic learning

UNIT-V

Expert System: Representation - Expert System shells - Knowledge Acquisition, domain exploration meta knowledge, inference engine, self-explaining system, Application and Working of Ant Colony System. case study of MYCIN and DENDRAL

Text Books:

1. Elaine Rich, Kevin Knight and Shivashankar B.Nair, “Artificial Intelligence”, Tata McGraw-Hill, Third edition, 2009. (UNITs I, II, III & V)
2. Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education Asia, Second edition, 2003. (UNIT IV)
3. N. P. Padhy, “Artificial Intelligence and Intelligent System”, Oxford University Press, Second edition, 2005. (UNIT V)

Reference Books:

1. Rajendra Akerkar, “Introduction to Artificial Intelligence”, Prentice-Hall of India, 2005.
2. Patrick Henry Winston, “Artificial Intelligence”, Pearson Education Inc., Third edition, 2001.
3. Eugene Charniak and Drew Mc Dermott, “Introduction to Artificial Intelligence", Addison-Wesley, ISE Reprint, 1998.
4. Nils J.Nilsson, “Artificial Intelligence - A New Synthesis", Harcourt Asia Pvt. Ltd., Morgan Kaufmann, 1988.

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Course Title: **Advance Computer Networks** ***(Elective-II)***	Course Code: **KAD660**
Credit: 3.5	L **3** T **1** P **0**
Year: **2nd**	Semester: **IV**

Prerequisite: Computer Networks

UNIT-I

Internetworking: IP Addressing, Sub netting, Address Resolution Protocols, Routing Protocols- Interior Router Protocols & Exterior Router Protocols, Congestion Control at Network layer, Next Generation IP protocol, ICMPv6. IP Multicasting, Multicasting Routing Protocols, Multicast Congestion Control

UNIT-II

Wireless Internet: IP Limitations, Mobile IP & its working, Issues in Mobile IP. TCP over Wireless-Mobile TCP. TCP extensions for high speed network, Security related issues, Transaction-oriented application, TCP Congestion Control. Network Performance Analysis, High Performance Networks, Overlay Network, Peer-to-Peer,

UNIT-III

Wireless Networks: WLANs & WLLs IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

UNIT-IV

Network Security at Various Layers. Secure-HTTP, SSL, ESP, Authentication header, Key distribution protocols. Digital signatures, Digital certificates.

UNIT-V

Issues of Network Programming, BSD Sockets, TCP/IP programming, Network performance analysis using NS2

Text Books:

1. J Schiller, Mobile Communication,2/e, Pearson Education Ltd.,India,2003
2. Andrew S. Tanenbaum, Computer Network,5/e, Pearson Education Ltd.,India,2010
3. W. Stallings, Computer Networking with Internet Protocols and Technology, 1/e, Pearson Education Ltd.,India,2004

Reference Books:

1. Charles E. Perkins, Adhoc Networking,1/e, Addison-Wesley, USA, 2001
2. Behrouz Forouzan, TCP/IP Protocol Suite,4/e, TMH, India, 2009
3. Douglas E. Comer, Internetworking with TCP/IP Volume One, 6/e, Addison-Wesley, USA, 2013
4. C.E. Perkins, B. Woolf and S.R. Alpert, "Mobile IP, Design Principles and Practices",1/e, Addision Wesley, USA, 1997

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Course Title: **Cryptography and Network Security** ***(Elective-II)***	Course Code: **KAD670**
Credit: 3.5	L **3** T **1** P **0**
Year: **2nd**	Semester: **IV**

UNIT-I

Introduction to Cryptography: Introduction To Security: Attacks, Services & Mechanisms, Security, Attacks, And Security Services. Conventional Encryption: Classical Techniques, Conventional Encryption Model, and Steganography, Classical Encryption Techniques. Modern Techniques: Simplified DES, Block Cipher Principles, DES Standard, DES Strength, Differential & Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes Of Operation.

UNIT-II

Conventional Encryption Algorithms: Triples DES, Blowfish, International Data Encryption Algorithm, RCS, CAST-128, RC2 Placement & Encryption Function, Key Distribution, Random Number Generation, Placement Of Encryption Function.

UNIT-III

Public Key Encryption: Public-Key Cryptography: Principles Of Public-Key Cryptosystems, RSA Algorithm, Key Management, Fermat's & Euler's Theorm, Primality, The Chinese Remainder Theorem.

UNIT-IV

Hash Functions: Message Authentication & Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Birthday Attacks, Security Of Hash Function & MACS, MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA), Digital Signatures: Digital Signatures, Authentication Protocol, Digital Signature Standard (DSS), Proof Of Digital Signature Algorithm.

UNIT-V

Network & System Security: Authentication Applications: Kerberos X.509, Directory Authentication Service, Electronic Mail Security, Pretty Good Privacy (PGP), S / Mime, Security: Architecture, Authentication He ader, Encapsulating Security Payloads, Combining Security Associations, Key Management, Web Security: Secure Socket Layer & Transport Layer Security, Secure Electronic Transaction (Set), System Security: Intruders, Viruses, Firewall Design Principles, Trusted Systems.

Text Books:

1. Behrouz A Frorouzan,Cryptogrphy and Network Security,Special Edition,TMH,India,2008

Reference Books:

1. Johannes A. Buchmann, "Introduction to cryptography", 2/e,Springer- Verlag,USA,2004
2. Atul Kahate, "Cryptography and Network Security",2/e, TMH, New Delhi,2005

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Course Title: **Parallel Computing** ***(Elective-II)***	Course Code: **KAD680**
Credit: 3.5	L **3** T **1** P **0**
Year: **2nd**	Semester: **IV**

UNIT-I

Principles of parallel algorithm design: decomposition techniques, mapping & scheduling computation, templates, Programming shared-address space systems: Cilk Plus, Open MP, Pthreads, Parallel computer architectures: shared memory systems and cache coherence, distributed-memory systems, interconnection networks and routing

UNIT-II

Computational demands, advantages of parallel systems. Flynn's classification, controlled parallelism and scalability. Topologies: Mesh, binary tree, Hyper tree, Cube Connected cycles, shuffle-Connected Exchange; Uniform Memory Access (UMA & Non uniform Memory Access (NUMA) Multi processor System.

UNIT-III

PARAM Model of Parallel Computation, PARAM Algorithms; Parallel Reductions, Prefix sum, List Ranking, Merging of Two Sorted List.

UNIT-IV

Mapping and Scheduling; mapping of Data from Topology to other (Ring to 2-D Mesh, Binomial trees to 2-D mesh, Rings & mesh into 2-D Mesh, Ring & Mesh into Hypercubes), Load balancing,

UNIT-V

Static scheduling on UMA multi-processor systems. Applications of parallel computing: Matrix Multiplication, Sorting (bitonic Merge sort, parallel quick sort, hyper quick sort), Searching a Graph (P-depth search, Breadth-Depth Search, Breath firstsearch), parallel branch and bound algorithms.

Text Books:

1. Ananth Grama, Introduction to Parallel Computing, 2/e, Pearson Education,England,2003

Reference Books:

1. Michel J. Quinn, **Parallel Computing: Theory and Practice**, 2/e, TMH, India, 2002
2. Kai Hwang, **Advanced Computer Architecture**, 2/e, TMH, India, 2011
3. Peter Pacheco, **An Introduction to Parallel Programming**,1/e, Morgan Kaufmann, USA, 2011

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Course Title: **Value Added Training**	Course Code: **KAD320**
Credit: 1	L **0** T **0** P **2**
Year: **2nd**	Semester: **IV**

Unit I- What is Android: Brief History of Embedded Device Programming, Introduction to Android, Downloading and Installing Eclipse, Downloading and Installing the Android SDK.

Unit II- What Is in the Android SDK? Application Life Cycle: Standard ASP Application Life Cycle, Android Application Life Cycle, Creating Your First Android Project in Eclipse, Examining the Android-Created Files: Android Manifest.xml, Referenced Libraries, Directories, Hello World! XML-Based UI, Hello World! CODE-Based UI

Unit III- Using Intents and the Phone Dialer, What Are Intents?, Using the Dialer, Placing a Call from Your Activity, Adding the Intent to Your Activity, Modifying the Android Phone Dialer, Adding a Button, Implementing an Edit Text View

Unit IV- Lists, Menus, and Other Views, Building the Activities, Intent Code for the .xml File, Intent Code for the .java File, Using the Menu, Creating the Activity for AutoComplete, Button, Check Box, Edit Text, Radio Group

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Course Title: **.Net Framework and C# Programming**	Course Code: **KAE210**
Credit: 4	L **3** T **0** P **2**
Year: **3rd**	Semester: **V**

UNIT-1

The .Net framework: Introduction, The Origin of .Net Technology, Common Language Runtime (CLR), Common Type System (CTS), Common Language Specification (CLS), Microsoft Intermediate Language (MSIL), Just-In –Time Compilation, Framework Base Classes.

UNIT-II

C -Sharp Language (C#): Introduction, Data Types, Identifiers, Variables, Constants, Literals, Array and Strings, Object and Classes, Inheritance and Polymorphism, Operator Overloading, Interfaces, Delegates and Events. Type conversion

UNIT-III

C# Using Libraries: Namespace- System, Input-Output, Multi-Threading, Networking and sockets, Managing Console I/O Operations, Windows Forms, Error Handling.

UNIT-IV

Advanced Features Using C#: Web Services (WSDL,UDDI,SOAP),Asp.net Web Form Controls: Server Control, HTML controls, **ADO.Net:** Connection (OleDB Connection and SqlConnection), Command, Data Readers, Data Adapters and DataSet , Unsafe Mode

UNIT-V

.Net Assemblies and Attribute: .Net Assemblies features and structure, private and share assemblies, Built-In attribute and custom attribute. Introduction about generic

Text Books:

1. A Guide to the Project Management Body of Knowledge (PMBOK),5/e, Project Management Institute, USA, 2013.
2. Harold Kerzner, Frank P. Saladis, Project Management Workbook and PMP/CAPM Exam Study Guide ,11/e,John-Wiley & Sons,USA,2013
3. Saurabh Nandu et al,C#.Net Web Developer's Guide,1/e,Syngress Publishing Inc,USA,2002
4. Karli Watson, Christian Nagel , Beginning Visual C# 2010",1/e,Wrox,USA,2010.

Reference Books:

1. Simon Robinson, Christian Nagel, Karli Watson, Jay Glynn, Morgan Skinner, Bill Evjen, Professional C# 3/e,Wrox p2p series,USA,2004
2. Christian Nagel et al, Professional C# and .Net 4,1/e,Wrox,USA,2010.
3. Fergal Grimes," Microsoft .Net for Programmers",1/e,Manning,USA,2002
4. Matt tells,C# Black Book,1/e,CORIOLIS,USA,2001
5. Mark Michaelis, "Essential C# 3.0: For .NET Framework 3.5, 2/e, Pearson Education, India, 2008

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List of Experiments

1. First Console Application (Hello World) in C#
2. Program to demonstrate Convert function
3. Program to demonstrate Boolean Operators
4. Write a program to take two numbers from user and determine the largest one?
5. Write a program to calculate simple interest
6. Draw Mandelbrot sets using for loop and switch case
7. Write a program using enum
8. Write a program using struts
9. Write a program using string arrays
10. Write a program using properties
11. Write a program for single level inheritance
12. Write a program for polymorphism
13. Write a program for method overriding
14. Write a program of single cast delegate
15. Write a program of multicast delegate
16. Write a program of using event
17. Write a program of exception handling
18. Write a program of multithreading
19. Write a program of indexers
20. Write a program of creating a assembly
21. Write a program of unsafe code
22. Write a program of boxing
23. Write a program of unboxing
24. Write a program of Arraylist Collection
25. Write a program of HashTable collection
26. Write a program of reading and writing to a data file

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Course Title: **Mobile and Ad-hoc Computing**	Course Code: **KAE010**
Credit: 3.5	L **3** T **1** P **0**
Year: **3rd**	Semester: **V**

UNIT-I

Issues in Mobile Computing, Wireless Telephony: Frequency Reuse, Cell Design, Cellular Architecture. Digital Cellular Standards, GSM: air-interface, channel structure, location management: HLR-VLR, Handoffs, Channel allocation in cellular systems, CDMA, GPRS, Overview of 3G Cellular Networks

UNIT-II

Wireless Networking, WLAN Overview, Infrared LAN, Spread-Spectrum LAN, Narrowband Microwave LAN, MAC issues, MACA & MACAW, IEEE 802.11, IEEE 802.16, Bluetooth, Wireless Metropolitan Area Networks (Wireless Local Loop), Wireless Multiple Access.

UNIT-III

Wireless Internet: IP Limitations, Mobile IP & its working, Issues in Mobile IP. TCP over Wireless, Wireless Access Protocol (WAP): Architecture & Protocol Stack. Security in Wireless Systems, Mobile Agents Computing, Transaction Processing in Mobile Computing Environment

UNIT-IV

Ad Hoc Networks: Ad Hoc Networks vs. Cellular Networks, Issues in Ad Hoc Wireless Networks,

MAC Protocols, Routing Protocols for Ad Hoc Wireless Networks-Design Issues and Classification, Proactive Routing Protocols, Reactive Routing Protocols, Hybrid Routing Protocols.

UNIT-V

Wireless Sensor Networks: Overview, Application Areas, Sensor Nodes' Architecture, Data Aggregation, Routing, and Query Processing in WSN.

Text Books:

1. J Schiller, Mobile Communication,2/e,Pearson Education Ltd.,India,2003
2. Charles E. Perkins, Adhoc Networking,1/e, Addison-Wesley,USA,2001

Reference Books:

1. Shambhu Upadhyaya et al, Mobile Computing: Implementing Pervasive Information and Communications Technologies , Illustrated edition, Springer US, USA, 2013
2. Shambhu Upadhyaya et al, Mobile Computing, 1/e, Springer India, India, 2008
3. C S R Prabhu, Mobile Computing: A Book of Reading, 1/e, Universities Press, India, 2003
4. Gordon L, Principles of Mobile Communication,3/e, Springer, USA, 2012
5. Sipra Das Bit, Biplab K. Sikdar, "Mobile Computing", 1/e, PHI Learning, India, 2009
6. Vijay Garg et al, "Wireless Networking Complete",1/e, Elsevier, Morgan Kaufmann Publisher, USA, 2004
7. Feng Zhao, Leonidas J. Guibas, Wireless Sensor Networks: An Information Processing Approach, 1/e, Elsevier Morgan Kaufmann, USA, 2004

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Course Title: **Cloud Computing**	Course Code: **KAE020**
Credit: 3	L **3** T **0** P **0**
Year: **3rd**	Semester: **V**

UNIT-I

Understanding Cloud Computing: Cloud Computing – History of Cloud Computing – Cloud Architecture – Cloud Storage –Why Cloud Computing Matters – Advantages of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud Today – Cloud Services

UNIT-II

Developing Cloud Services: Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service –Platform as a Service – Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools – Amazon Ec2 – Google App Engine – IBM Clouds

UNIT-III

Cloud Computing For Everyone: Centralizing Email Communications – Collaborating on Schedules – Collaborating on To-Do Lists –Collaborating Contact Lists – Cloud Computing for the Community – Collaborating on Group Projects and Events – Cloud Computing for the Corporation

UNIT-IV

Using Cloud Services 10: Collaborating on Calendars, Schedules and Task Management – Exploring Online Scheduling Applications – Exploring Online Planning and Task Management – Collaborating on Event Management – Collaborating on Contact Management – Collaborating on Project Management – Collaborating on Word Processing - Collaborating on Databases – Storing and Sharing Files

UNIT-V

Other Ways to Collaborate: Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services – Evaluating Web Conference Tools – Collaborating via Social Networks and Groupware – Collaborating via Blogs and Wikis

Text Books:

1. Furht, Borko, Escalante, Armando, Handbook of Cloud Computing,1/e, Springer, USA, 2010
2. Thomas Erl et al, Cloud Computing: Concepts, Technology & Architecture,1/e, Prentice Hall, USA, 2013

Reference Books:

1. Harjot Dhawan, A Road to Cloud Computing:A Beginner's Perspective, LAP Lambert Academic Publishing, USA, 2012
2. Judith Hurwitz, Cloud Computing for Dummies,1/e ,John Wiley & Sons, USA, 2010
3. Rajkumar Buyya, Cloud Computing: Principles and Paradigms,1/e, John Wiley & Sons, USA, 2011

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Course Title: **Principles of Compiler Design** ***(Elective-III)***	Course Code: **KAE610**
Credit: 3.5	L **3** T **1** P **0**
Year: **3rd**	Semester: **V**

UNIT-I

Introduction: Review of Languages & Grammar, Compiler and Interpreter- Basic Concepts, Phases and Passes, Finite State Machines & Regular Expressions and their application to Lexical Analysis, Design Issues using Finite State Machines, Scanner Generator- LEX, Formal Grammar and their application to Syntax Analysis, Ambiguous Grammar, The Syntactic specification of Languages: CFG, Derivation and Parse Trees, Capabilities of CFG, BNF Notation.

UNIT-II

Basic Parsing Techniques: Parsing-Top Down and Bottom-Up Strategies: General Consideration.

Top Down Parsing: Brute-Force Method, Recursive Descent, & Predictive Paring, Bottom-Up Parsing: Shift Reduce Parsing, Operator Precedence Parsing. LR Grammars-LR(0), SLR(1), Canonical LR(1) & LALR(1) Parser, Comparison of parsing methods.

UNIT-III

Semantic Analysis: Basic Concepts, Syntax Directed Definitions-Inherited & Synthesized Attributes, Evaluation Orders of SDDs. Syntax directed Translation Schemes, Intermediate Codes, Postfix notation, Parse Trees and Syntax Trees, Directed Acyclic Graphs, Three address Codes: Quadruple & Triples, Translation of Assignment Statements, Boolean expressions, Control Statements, Postfix Translation, Translation with a Top Down Parser, Array references in Arithmetic expressions , Procedure Calls, Declarations and Case statements Translations.

UNIT-IV

Symbol Tables: Organization of Non-Block Structured Language (Unordered/Ordered/Tree/Hash) and Block Structured Language (Stack Tables & Stack Implementation), Runtime Storage Management: Static Allocation, Dynamic Allocation- Activation Records and their usage, Recursive Procedure. Heap Allocation-Storage Registers and Release Strategies.

UNIT-V

Error detection and Recovery: Code Optimization- Basic Blocks and Optimization, Loop Optimizaton, Flow Graph Analysis, Machine Dependent Optimization.

Error Handling: Detection, Reporting, Recovery and Maintenance, Compiler-Compiler—YACC, Code Generation, Concept of Compiler Design for Object-Oriented Language.

Text Books:

1. Aho, Ullman & Sethi, "**Compiler Design: Principles, Techniques & Tools**", 2/e, Addison Wesley, USA, 2006

Reference Books:

1. D.M. Dhamdhere, "**Compiler Construction – Principles & Practice",** 2/e, Macmillan India Ltd, India, 2008
2. Charles Fischer et al, Crafting a Compiler with C, 2/e, PHI, India, 2008

Department of Computer Applications
Detailed Course Structure & Syllabus of MCA
Batch 2016-18

Course Title: **Real Time and Embedded Systems** ***(Elective-III)***	Course Code: **KAE620**
Credit: 3.5	L **3** T **1** P **0**
Year: **3rd**	Semester: **V**

UNIT-I

Introduction: Concept of Real Time System, Issues in real time computing, Performance measures of Real Time System, Issues in Real Time Computing, Performance measures of Real time Systems, Real Time Application.

Task Assignment and Scheduling: Different task model, Scheduling hierarchy, offline vs Online scheduling, Clock Drives.

UNIT-II

Model of Real Time System: Processor, resources, temporal parameter, Periodic Task Model, Sporadic Task Model, Precedence Constraints and Data Dependencies, Scheduling hierarchy, **Scheduling of Periodic Task:** Assumptions, fixed versus dynamic priority algorithms, schedulability test for fixed priority task with arbitrary deadlines. **Scheduling of Aperiodic and Sporadic Tasks:** Assumptions and approaches, deferrable, sporadic servers, slack stealing in deadline driven and fixed priority systems. Two level schemes for integrated scheduling, Scheduling for applications having flexible constrains.

UNIT-III

Resources and Resource Access Control: Assumptions on resources and their usage, resource contention, resource access control (Priority Ceiling Protocol, Priority Inheritance protocol, Slack Based Priority Ceiling Protocol, Peremption Ceiling Protocol).

UNIT-IV

Multi-Processor Scheduling: Model of multi-processor and distributed systems, scheduling algorithms for end to end periodic tasks in homogeneous/heterogeneous systems, Predictability and validation of dynamic multiprocessor system.

UNIT-V

Real time Communication: Model of real time Communication, Priority base service for switched network, Weighted Round Robin Service, Medium access Control Protocol, Real Time Protocol.

Text Books:

1. Jane .W. S. Liu **"Real Time Systems**",1/e, Pearson Higher Education,USA,2000.

Reference Books:

1. Bruce Powel Douglass, Real Time Design Patterns: Robust Scalable Architecture for Real Time Systems,1/e, Addison-Wesley Professional, USA, 2002
2. Rick Grehan et al,Real Time Programming: A Guide to 32 bit embedded development,1/e, Addison-Wesley Professional, USA, 1998
3. Christopher Hallinan, Embedded Linux Primer: A Practical Real World Approach, 2/e, Prentice Hall, USA, 2010
4. Christer Ericson, Real-time Collision Detection,1/e, Morgan Kaufmann,USA,2004
5. Bran Selic, Sébastien Gérard, Modeling and Analysis of Real-Time and Embedded Systems with UML and MARTE,1/e, Elsevier / Morgan Kaufmann, USA, 2013
6. Krishna .C.M "**Real Time Systems**", 3Reprint, TMH, India, 2010

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Course Title: **Operations Research** *(Elective-III)*	Course Code: **KAE630**
Credit: 3.5	L **3** T **1** P **0**
Year: **3rd**	Semester: **VI**

UNIT-I

Linear programming : graphical methods for two dimensional problems – central problem of linear programming – various definitions – statements of basic theorems and properties – phase (i) and phase (ii) of the simplex method – revised simplex method –primal and dual – dual simplex method – sensitivity analysis – transportation problem and its solution – assignment problem and its solution by Hungarian method.

UNIT-II

Integer programming: Gomory cutting plane methods – branch and bound method. Queuing theory: characteristics of queuing systems – steady state m/m/1,m/m/1/k and m/m/c queuing models. Replacement theory: replacement of items that deteriorate – replacement of items that fail group replacement and individual replacement.

UNIT-III

Inventory theory: costs involved in inventory problems – single item deterministic models – economic lot size models without shortages and with shortages having partition rate infinite and finite.

UNIT-IV

Pert and CP/M : arrow network- time estimates – earliest expected time, latest allowable occurrence time, latest allowable occurrence time and slack – critical path – probability of meeting scheduled date of completion of project – calculation of CP/M network – various floats for activities – critical path – updating project – operation time cost trade off curve – selection of schedule based on cost analysis

UNIT-V

Game Theory: The formation of Twoperson, Zerosum games, solving simple games, games with mixed strategies, Graphical solution Procedure, Solving by LP.

Text Book:

1. Sharma et al, **Operation Research: Theory and Applications**, 4/e, McMillan Publishing Company, NY, 2009

Reference Books:

1. Godfrey C. Onwubolu, B. V. Babu, **New Optimization Techniques in Engineering**, 1/e, Springer, USA, 2004

2. Hillier F., and Lieberman G. J., **Introduction to Operation Research**, 9/e, Holden Day, NY,2010

3. Taha, H.A., **Operations Research – An Introduction**, 8/e, McMillan Publishing Company, NY, 2008

4. Stephen Boyd et al, **Convex Optimization**, 7/e, Cambridge University Press, United Kingdom Cambridge, 2009

Department of Computer Applications
Detailed Course Structure & Syllabus of MCA
Batch 2016-18

Course Title: **Modeling and Simulation** ***(Elective-III)***	Course Code: **KAE640**
Credit: 3.5	L **3** T **1** P **0**
Year: **3rd**	Semester: **V**

UNIT-I

Introduction to Modeling and Simulation: Nature of Simulation. Systems, Models and Simulation, Continuous and Discrete Systems, system modeling, concept of simulation, Components of a simulation study, Principles used in modeling, Static and Dynamic physical models, Static and Dynamic Mathematical models Introduction to Static and Dynamic System simulation, Advantages, Disadvantages and pitfalls of Simulation.

UNIT-II

System Simulation and Continuous System Simulation: Types of System Simulation, Monte Carlo Method, Comparison of analytical and Simulation methods, Numerical Computation techniques for Continuous and Discrete Models, Distributed Lag Models, Cobweb Model. Continuous System models, Analog and Hybrid computers, Digital- Analog Simulators, Continuous system simulation languages, Hybrid simulation, Real Time simulations.

UNIT-III

System Dynamics & Probability concepts in Simulation: Exponential growth and decay models, logistic curves, Generalization of growth models, System dynamics diagrams, Multi segment models, Representation of Time Delays. Discrete and Continuous probability functions, Continuous Uniformly Distributed Random Numbers, Generation of a Random numbers, Generating Discrete distributions, Non-Uniform Continuously Distributed Random Numbers, Rejection Method.

UNIT-IV

Simulation of Queuing Systems and Discrete System Simulation: Poisson arrival patterns, Exponential distribution, Service times, Normal Distribution Queuing Disciplines, Simulation of single and two server queue. Application of queuing theory in computer system. Discrete Events, Generation of arrival patterns, Simulation programming tasks, Gathering statistics, Measuring occupancy and Utilization, Recording Distributions and Transit times.

UNIT-V

Introduction to Simulation languages and Analysis of Simulation output GPSS: Action times, Succession of events, Choice of paths, Conditional transfers, program control statements. SIMSCRIPT: Organization of SIMSCRIPT Program, Names & Labels, SIMSCRIPT statements. Estimation methods, Relication of Runs, Batch Means, Regenerative techniques , Time Series Analysis, Spectral Analysis and Autoregressive Processes.

Text Books:

1. Wainer, A. G, Discrete-Event Modeling and Simulation: A Practitioners Approach, CRC Press, Boca Raton, FL, 2009
2. Dingyü Xue, YangQuan Chen, System Simulation Techniques with MATLAB and Simulink,John Wiley & Sons,UK,2014

References Books:

1. Banks, J., J.S. Carson, B.L. Nelson, and D.M. Nicol, Discrete-Event System Simulation,4/e, Prentice-Hall, Upper Saddle River, NJ, 2005
2. Law, A.M. and W.D. Kelton, Simulation Modeling and Analysis, 3/e, McGraw-Hill, New York, NY,2000
3. North J. M. and C. M. Macal, Managing Business Complexity: Discovering Strategic Solutions with Agent-Based Modeling and Simulation, 1/e, Oxford University Press, Oxford, New York,2007
4. Robinson, S., Simulation: The Practice of Model Development and Use,1/e, John Wiley & Sons, England,2004

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Course Title: **Wireless Sensor Networks** ***(Elective-IV)***	Course Code: **KAE650**
Credit: 3.5	L **3** T **1** P **0**
Year: **3rd**	Semester: **V**

UNIT- I

Introduction: Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Mobile Adhoc NETworks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks Sensor Node Hardware and Network Architecture: Single-node architecture, Hardware components & design constraints, Operating systems and execution environments, introduction to TinyOS and nesC, Network architecture, Optimization goals and figures of merit, Design principles for WSNs, Service interfaces of WSNs, Gateway concepts.

UNIT-II

Deployment and Configuration: Localization and positioning, Coverage and connectivity, Single-hop and multihop localization, self-configuring localization systems, sensor management.

UNIT-III

Network Protocols: Issues in designing MAC protocol for WSNs, Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and Zig Bee, Dissemination protocol for large sensor network.

UNIT-IV

Routing protocols: Issues in designing routing protocols, Classification of routing protocols, Energy-efficient routing, Unicast, Broadcast and multicast, Geographic routing.

UNIT-V

Data Storage and Manipulation: Data centric and content based routing, storage and retrieval in network, compression technologies for WSN, Data aggregation technique.
Applications: Detecting unauthorized activity using a sensor network, WSN for Habitat Monitoring.

Text Books:

1. Waltenegus Dargie, Christian Poellabauer, Fundamentals of Wireless Sensor Networks: Theory and Practice, 1/e, Wiley, India, 2010
2. Kai Zeng, Wenjing Lou, Ming Li , Multihop Wireless Networks: Opportunistic Routing,1/e, Wiley, India,2011

References:

1. HolgerKerl, Andreas Willig, **Protocols and Architectures for Wireless Sensor Network**,1/e, Wiley, India, 2005
2. Raghavendra, Cauligi S, Sivalingam, Krishna M., Zanti Taieb, **Wireless Sensor Network**, 1/e, Springer, USA, 2004
3. Feng Zhao, Leonidas Guibas, **Wireless Sensor Network**, 1/e, Elsevier, USA, 2004
4. Kazem, Sohraby, Daniel Minoli, TaiebZanti, **Wireless Sensor Network: Technology, Protocols and Application**, 1/e, John Wiley and Sons, USA, 2007
5. B. Krishnamachari, **Networking Wireless Sensors**, 1/e, Cambridge University Press,UK,2006

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Course Title: **Fault Tolerance Computing** ***(Elective-IV)***	Course Code: **KAE660**
Credit: 3.5	L **3** T **1** P **0**
Year: **3rd**	Semester: **V**

UNIT-I

Definitions of fault tolerance, fault classification, fault tolerant attributes and system structure. Information redundancy, hardware redundancy, and time redundancy.

UNIT-II

Fault Tolerant Design :Basic concepts on dynamic, hybrid and self purging ,software redundancy, fail-soft operation**,** Network Redundancy and Fault Tolerance , Software and Hardware Checkpointing, examples of practical fault tolerant systems.

UNIT-III

Basic concepts of Reliability: Failures and faults, Reliability and failure rate, Relation between reliability & mean time between failure, Maintainability & Availability, reliability of series and parallel systems. Modeling of faults. Test generation for combinational logic circuits : conventional methods (path sesitisation, Boolean difference), Random testing, transition count testing and signature analysis**.**

UNIT-IV

Fault tolerant networks for Shared bus and Shared memory Architecture. Security, fault tolerance in wireless/mobile networks and Internet.

UNIT-V

System level diagnosis, Error correcting codes: Hamming codes, SED-DED codes, SEC-SBD codes, cyclic codes, Watchdog techniques, check pointing and error recovery, Software Fault Tolerance.

Text Books:

1. D.K. Pradhan, **Fault-Tolerant Computer System Design**,1/e ,Prentice Hall,USA 2003.

References:

1. Mostafa Abd-El-Barr, Design and Analysis of Reliable and Fault-Tolerant Computer Systems, 1/e, World Scientific,USA,2006
2. Lala, P.K., Self-checking and Fault-Tolerant Digital Design, 1/e, Morgan Kaufmann, San Francisco, CA, USA, 2001.
3. Shooman, M.L., Reliability of Computer Systems and Networks, 1/e, Wiley, USA, 2002

Department of Computer Applications
Detailed Course Structure & Syllabus of MCA
Batch 2016-18

Course Title: **Big Data Analysis** ***(Elective-IV)***	Course Code: **KAE670**
Credit: 3.5	L **3** T **1** P **0**
Year: **3rd**	Semester: **V**

UNIT I

What is Big Data, Hadoop Architecture, Hadoop ecosystem components, Hadoop Storage: HDFS, Hadoop Processing: MapReduce Framework, Hadoop Server Roles: NameNode, Secondary NameNode, and DataNode, Anatomy of File Write and Read.

Hadoop Cluster Architecture, Hadoop Cluster Configuration files, Hadoop Cluster Modes, Multi-Node Hadoop Cluster, A Typical Production Hadoop Cluster, MapReduce Job execution, Common Hadoop Shell commands, Data Loading Techniques: FLUME, SQOOP, Hadoop Copy Commands, Hadoop Project: Data Loading

UNIT II

Hadoop Data Types, Hadoop MapReduce paradigm, Map and Reduce tasks, MapReduce Execution Framework, Partitioners and Combiners, Input Formats (Input Splits and Records, Text Input, Binary Input, Multiple Inputs), Output Formats (Text Output, Binary Output, Multiple Output), Hadoop Project: MapReduce Programming

UNIT III

Counters, Custom Writables, Unit Testing: JUnit and MRUnit testing framework, Error Handling, Tuning, Advance MapReduce, Hadoop Project: Advance MapReduce programming and error handling.

Installing and Running Pig, Grunt, Pig's Data Model, Pig Latin, Developing & Testing Pig Latin Scripts, Writing Evaluation, Filter, Load & Store Functions, Hadoop Project: Pig Scripting

UNIT IV

Hive Architecture and Installation, Comparison with Traditional Database, HiveQL: Data Types, Operators and Functions, Hive Tables(Managed Tables and External Tables, Partitions and Buckets, Storage Formats, Importing Data, Altering Tables, Dropping Tables), Querying Data (Sorting And Aggregating, Map Reduce Scripts, Joins & Sub queries, Views, Map and Reduce side Joins to optimize Query)

UNIT V

Hive: Data manipulation with Hive, User Defined Functions, Appending Data into existing Hive Table, Custom Map/Reduce in Hive, Hadoop Project: Hive Scripting, HBase: Introduction to HBase, Client API's and their features, Available Client, HBase Architecture, MapReduce Integration.

Text Books:

1. Garry Turkington, Hadoop Beginner's Guide, 1/e, Packet Publishing, USA,2011
2. Tom White, Hadoop: The Definitive Guide, 3/e, O'Reilly Media, Inc, USA,2012

Reference Books:

1. Chuck Lam, Hadoop In Action, 1/e, Manning Publication, USA, 2012
2. Alan Gates, Programming Pig , 1/e, O'Reilly Media, USA, 2011
3. Jimmy Lin and Chris Dyer, Data-Intensive Text Processing with MapReduce, 1/e, Morgan & Claypool, USA, 2010

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Course Title: **Digital Image Processing** ***(Elective-IV)***	Course Code: **KAE680**
Credit: 3.5	L **3** T **1** P **0**
Year: **3rd**	Semester: **V**

UNIT-I

Introduction and Fundamentals : Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization. Introduction of image standard JPG, GIF, TIFF, PNG.

Image Enhancement in Spatial Domain: Introduction; Basic Gray Level Functions – Piecewise- Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations, Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

UNIT-II

Image Enhancement in Frequency Domain: Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering. **Image Restoration:** A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

UNIT-III

Color Image Processing: Color Fundamentals, Color Models, Converting Colors to different models, Color Transformation, Smoothing and Sharpening, Color Segmentation.

Morphological Image Processing: Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

UNIT-IV

Registration: Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth.

UNIT-V

Segmentation: Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

Text Books:

1. S. Salivahanan et al, Digital Signal Processing, 3rd edition, TMH, 2000.
2. L. R. Rabiner & B. Gold, Theory and Application of Digital Signal Processing, 3rd edition, PHI, NJ, 2009

Reference Books:

1. R.J. Schalkoff, Digital Image Processing and Computer Vision,3rd Edition, John Wiley and Sons, NY, 1996.
2. K. Jain, Fundamentals of Digital Image Processing, 2nd edition, Prentice Hall, Upper Saddle River, NJ, 2004.
3. Vinay K. *Ingle*, John G. Proakis, Digital Signal Processing using MATLAB, 3rd edition, Thomson Delmar-*Vikas* Pub. , 2007.
4. S. K. Mitra, Digital Signal Processing - A Computer based approach, 2nd edition, TMH, 2002.

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Detailed Course Structure & Syllabus of MCA
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Course Title: **Multimedia Systems** ***(Elective-V)***	Course Code: **KAE690**
Credit: 3.5	L **3** T **1** P **0**
Year: **3rd**	Semester: **V**

Objectives: objective of this subject is to introduce the students with the multimedia devices and its applications. It will enable the students to combine the different media to deliver the information to the user so that it can be represented in the effective and efficient manner.

Prerequisites: None

UNIT-I

Evolution of Multimedia and its objects, Scope of multimedia in business & work, Production and planning of Multimedia applications. Multimedia hardware, Memory & Storage Devices, Communication Devices, Multimedia Software, Presentation and object generation tools, Video, sound, Image capturing, Authoring Tools, Card based, Page Based, and time based Authoring Tools.

UNIT-II

Production and Planning of Multimedia building blocks, Text, sound (MIDI), Digital Audio, Audio File Formats, Video File Formats, Audio & Video Capture.

UNI-IV

Digital Audio Concepts (digitization of audio signals), Sampling variables, Lossless compression of audio, lossy compression of audio.

UNIT-V

Multimedia monitor bitmaps, Vector drawing, Lossy graphic compression, Image file formatic animations Image standards, J P E G compression, Zig Zag coding, Video representation, colors, video compression, MPEG standards, MHEG standard.

UNIT-V

Multimedia Application Planning, Costing, Proposal preparation, and Financing-Case study of a typical industry.

Text Book:

1. Halsall F.; **Multimedia Communications: Applications**, Networks, Protocols and Standards, 4/e, Pearson Education, India, 2009.

Reference Books:

1. Sugata Mitra et al, **Introduction to Multimedia Systems**,1/e, Academic Press Elsevier, USA, 2001
2. Tay Vaughan, **Multimedia Making It work**, 7/e, Tata McGraw Hill, India, 2008.
3. Ralf Steinmetz, Klara Nahrstedt, **Multimedia Systems**, Springer Verlag, Germany,2004
4. Gerard Medioni, Parag Havalda, **Multimedia Systems: Algorithms, Standards, and Industry Practices**, 1/e, Cengage Learning,Canada,2010
5. Ze Nian Li, Mark S. Drew, **Fundamentals of Multimedia**,1/e, Person Higher Education, USA, 2004

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Course Title: **Ethical Hacking**	Course Code: **KAE600**
Credit: 3.5	L **3** T **1** P **0**
Year: **3rd**	Semester: **V**

UNIT-I

Casing the Establishment - What is footprinting- Internet Footprinting. -Scanning-Enumeration - basic banner grabbing, Enumerating Common Network services. Case study- Network Security Monitoring

UNIT-II

Securing permission - Securing file and folder permission. Using the encrypting file system. Securing registry permissions. Securing service- Managing service permission. Default services in windows 2000 and windows XP. Unix - The Quest for Root. Remote Access vs Local access. Remote access. Local access. After hacking root.

UNIT-III

Dial-up, PBX, Voicemail, and VPN hacking - Preparing to dial up. War-Dialing. Brude-Force Scripting PBX hacking. Voice mail hacking. VPN hacking. Network Devices – Discovery, Autonomous System Lookup. Public Newsgroups. Service Detection. Network Vulnerability. Detecting Layer 2 Media.

UNIT-IV

Wireless Hacking - Wireless Footprinting. Wireless Scanning and Enumeration. Gaining Access. Tools that exploiting WEP Weakness. Denial of Services Attacks. Firewalls- Firewalls landscape- Firewall Identification- Scanning Through firewalls- packet Filtering- Application Proxy Vulnerabilities. Denial of Service Attacks - Motivation of Dos Attackers. Types of DoS attacks. Generic Dos Attacks. Unix and Windows DoS

UNIT-V

Remote Control Insecurities - Discovering Remote Control Software. Connection. Weakness. VNC. Microsoft Terminal Server and Citrix ICA .Advanced Techniques Session Hijacking. Back Doors. Trojans. Cryptography. Subverting the systems Environment. Social Engineering. Web Hacking. Web server hacking web application hacking. Hacking the internet User - Malicious Mobile code, SSL fraud, E-mail Hacking, IRC hacking, Global countermeasures to Internet User Hacking.

Text Books:

1. Ankit Fadia, **The Unofficial Guide to Ethical Hacking**, 2/e, Macmillan Publishers, India, 2006

Reference Books:

1. Stuart McClure, Joel Scambray and Goerge Kurtz, **Hacking Exposed Network Security Secrets & Solutions, 7/e** Tata Mcgrawhill Publishers, India, 2012.
2. Matt Walker, **Certified Ethical Hacker All in one Exam Guide**, 1/e, TMH, India, 2011

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Course Title: **Genetic Algorithm and Neural Networks (*Elective-V*)**	Course Code: **KAE6A0**		
Credit: 3.5	L **3**	T **1**	P **0**
Year: **3rd**	Semester: **V**		

UNIT-I

Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection.

UNIT-II

Genetic operators, Mutation, Generational Cycle, Applications. An Overview of Combinatorial Optimization. Theoretical Foundations of Genetic Algorithms.

UNIT-III

Genetic Algorithms in Engineering and Optimization, Genetic Algorithms in Natural Evolution, Simulated Annealing and Tabu Search.

UNIT-IV

Artificial Neural Networks, Evolving Neural Networks, feed forward n/w, Threshold units, linear units, nonlinear units, stochastic units, capacity of simple perceptron, Reinforcement learning.
Learning: Supervised, Unsupervised (Hebbian/Competitive), Adaptive resonance theory, Travelling salesman problem

UNIT-V

Implementing Genetic Algorithms: GALib, Genetic Algorithm Optimization Toolbox (GAOT) under Matlab.

Text Books:

1. Goldberg, "Genetic Algorithms in search ,optimization & Machine Learning",4(Reprint), Pearson Education, Indi, 2009
2. Mitchell, "An Introduction to Genetic Algorithms," 1/e, MIT Press, London England, 1998
3. Simon O. Haykin, Neural Networks and Learning Machines, 3/e, Pearson Education, USA, 2009

Reference Books:

1. Hojjat Adeli et al, Machine Learning: Neural Networks, Genetic Algorithms, and Fuzzy Systems, 1/e, John Wiley & Sons, USA, 1995
2. Peter Flach, Machine Learning: The Art and Science of Algorithms that Make Sense of Data, 1/e, Cambridge University Press, UK, 2012
3. Ethem Alpaydin, Introduction to Machine Learning, 1/e, MIT Press, USA, 2004
4. Gareth James et al, An Introduction to Statistical Learning: with Applications in R, 1/e, Springer, USA, 2013

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Course Title: **Fuzzy Systems (*Elective-V*)**	Course Code: **KAE6B0**
Credit: 3	L **3** T **1** P **0**
Year: **3rd**	Semester: **V**

Objectives: At the end of this course, students will be able to: Describe and compute vague concepts using fuzzy sets and fuzzy logic, Construct fuzzy rules and perform fuzzy reasoning on them, Design, some common fuzzy systems and fuzzy controllers, Illustrate the organization, design and operation of some common fuzzy systems

UNIT-I

Fuzzy Systems: Probabilistic reasoning, Crisp set and Fuzzy set, Basic concepts of fuzzy sets, membership functions. Basic operations on fuzzy sets, Fuzzy Relations, Fuzzy Graphs, and Fuzzy, Arithmetic,. Fuzzy If-Then Rules, Fuzzy Implications and Approximate Reasoning

UNIT -II

Fuzzy Logic: Fuzzy Logic, Fuzzy Logic and Artificial Intelligence, Fuzzy Logic in Database and Information Systems.

UNIT -III

Fuzzy Logic in Pattern Recognition, Fuzzy Logic Control, Fuzzy Discrete Event Systems

UNIT-IV

Hybrid systems: Neuro- fuzzy and fuzzy genetic systems, applications to engineering problems.

UNIT- V

Application of FLC: Fuzzy logic control – Inverted pendulum – Image processing – Home heating system – Blood pressure during anesthesia – Introduction to neuro fuzzy controller.

Text Books:

1. George J. Klir, Bo Yuan, **Fuzzy Sets And Fuzzy Logic Theory And Applications**, 1/e, PHI, India, 2009

Reference Books:

1. Timothy J. Ross, **Fuzzy Logic with Engineering Applications**, 2/e, John Wiley & Sons, England, 2004

2. S Rajsekaran et al, **Neural Networks, Fuzzy Logic and Genetic Algorithm**, 1/e, PHI, New Delhi, 2006

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Detailed Course Structure & Syllabus of MCA
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Course Title: **Project**	Course Code: **KAE110**
Credit: 1	L **0** T **0** P **2**
Year: **3rd**	Semester: **V**

Guidelines for submission of MCA Project (Project-II)

All the candidates of MCA project are required to submit a project report based on the work done by him/her during the project period.

PROJECT TIME / MAN-HOURS

The MCA Projects would be approximately 25 man-hours and carries a total of 25/50 marks.

Number of students in a project group will not be more than two.

Technology / Programming Language to be used:

Project –I : C, Datastructures

Project- II : Java, .Net

Project Evaluation Guidelines:

The project is evaluated on the basis of following heads :

Presentation	-	15% of total marks.
Viva	-	15% of total marks.
Thesis/Project report	-	30% of total marks.

Software Coding

i)	Documentation	-	15% of total marks.
ii)	Software	-	25% of total marks.

SUMMARY/ABSTRACT

All students must submit a summary/abstract separately with the project report. Summary, preferably, should be of about 3-4 pages. The content should be as brief as is sufficient enough to explain the objective and implementation of the project that the candidate is going to take up. The write up must adhere to the guidelines and should include the following

1. Name / Title of the Project
2. Statement about the Problem

3. Why is the particular topic chosen?
4. Objective and scope of the Project
5. Methodology (including a summary of the project)
6. Hardware & Software to be used
7. What contribution would the project make?

Also any other important feature that makes the system stands out from the rest.

The following suggested guidelines must be followed in preparing the Final project Report:

Good quality white executive bond paper A4 size should be used for typing and duplication. Care should be taken to avoid smudging while duplicating the copies.

Page Specification :(Written paper and source code)

Left margin - 3.0 cms

Right margin- 1.0 cms

Top margin 2.5 cms

Bottom margin 2.5 cms

Page numbers - All text pages as well as program source code listing should be numbered at the bottom center of the pages.

Normal Body Text: Font Size: 12, Times New Roman, Double Spacing, Justified.

Paragraph Heading Font Size: 14, Times New Roman, Underlined, Left Aligned.

Chapter Heading Font Size: 20, Times New Roman, Centre Aligned.

Coding Font size: 10, Courier New, Normal

Submission of Project Report to the University: The student will submit his/her project report in the prescribed format. The Project Report should include:

1. One copy of the summary/abstract.
2. One hard Copy of the Project Report.
3. Soft copy of project on Floppy/CD in a thick envelope pasted inside of the back cover of the project report.

The Project Report may be about 50 pages (excluding coding).

FORMAT OF THE PROJECT REPORT

1. Cover Page with university logo, Student Name and Roll Number, Project Title and Guide's name.
2. Acknowledgement
3. Main Report
    - Objective & Scope of the Project
    - Theoretical Background

- Definition of Problem
- System Analysis & Design vis-a-vis User Requirements
- Details of Hardware & Software requirements
- Detailed Life Cycle of the Project
  o ERD, DFD

  o Input and Output Screen Design process involved

  o Methodology used for testing:

  o Test Report, Printout of the Reports, Printout of the Code Sheet
- Conclusion
- Future Scope of Project.
- **Annexure:**
  Data Dictionary (This should give a catalogue of the data elements used in the system / sub system developed. The following are the details required. Write NA if NOT applicable.

  Data Name , Aliases, if any Length (Size) Type, Numeric, Alpha, Binary etc.
  List of abbreviations, Figures, Tables
- References
- Bibliography Website
- Soft copy of the project on CD/Floppy

ACKNOWLEDGEMENTS

In the "Acknowledgement" page, the writer recognises his indebtedness for guidance and assistance of the thesis adviser and other members of the faculty. Courtesy demands that he also recognise specific contributions by other persons or institutions such as libraries and research foundations. Acknowledgements should be expressed simply, tastefully, and tactfully.

BIBLIOGRAPHY :(EXAMPLE)

1. D.L. Carney, J.I. Cochrane, "The 5ESS Switching System: Architectural Overview," *AT&T Technical Journal*, vol. **64 ,** no. **6** , July-August 1985, pp. 1339-1356.
2. A. Stevens, *C++ Database Development*, MIS Press, New York, 1992, p. 34.
3. J. Martin, *Computer Data-base Organization*, Prentice-Hall, Englewood Cliffs, NJ,1977, p. 53.
4. www. Ibm.com/in
5. www.intel.com/india

Binding & Color code of the report

Project – I

Spiral Binding,

Front Cover – Transparent

Back Cover – Blue

Project -II

Spiral Binding,

Front Cover – Transparent

Back Cover – Black

Department of Computer Applications
Course Structure for MCA Program
Batch: 2016-18

Course Title: **MAT LAB**			Course Code: **KAE120**
Credit: 1	L **0**	T **0**	P **2**
Year: **3rd**			Semester: **V**

Course Objectives

- understanding the MATLAB environment;
- being able to do simple calculations using MATLAB;
- being able to carry out simple numerical computations and analyses using MATLAB.

Knowledge and understanding

- understand the main features of the MATLAB development environment;
- use the MATLAB GUI effectively;
- design simple algorithms to solve problems;
- write simple programs in MATLAB to solve scientific and mathematical problems;
- know where to find help.

Contents

• Matlab fundamentals, Matrix Operations, Data Types, Data Analysis and Statistics, Equation systems, Curve Fitting, Programming in Matlab, Graphics, Graphical User Interface (GUI), System commands, Symbolic Math toolbox, Simulink

Reference Book:

Hanselman, Duane. Littlefield, Bruce. Mastering Matlab7 (international edition). Pearson/Prentice Hall.

Department of Computer Applications
Course Structure for MCA Program
Batch: 2016-18

Course Title: **Industrial Project**				Course Code: **KAF810**
Credit: 16	L --	T --	P --	
Year: **3rd**				Semester: **VI**

THINKING UP A PROJECT: You are expected to come up with your own idea for a Project. A wide range of topics is acceptable so long as there is substantial computing content and project is predominantly of a practical, problem-solving nature.

Start thinking about your project right in the beginning of Vth semester of MCA. If you want to do the project in industrial environment start your correspondence fairly early to find an organization, which is ready to accept you. By the end of Vth semester, you must submit your synopsis in the prescribed format given at the end of these guidelines (at least five or seven pages) along with copy of resume, willingness and proof of working of the supervisor to the MCA Vth semester coordinator DIT University. This must include the Title, Objectives, Methodology (main steps to carry out a project), expected output and organization where you intend to carry out the project. The work on the project/ thesis should be started only after approval of synopsis by the University.

PROJECT REPORT: The main purpose of the report is to explain what you did in your project. The reader should be able to see clearly what you set out to do and what you achieved. It should describe the problem addressed and explain why you tackled it in the way you did. It should include your own assessment of how successful the project was.

The length of the text is generally about 8000-10000 words, but the length should be dictated by what you have to say. A shorter report is also acceptable if content is good. Resist temptation to include pages of padding.

The work that is presented for examiners should be your own. The presentation of another person's work, design or program as though they are your own is a serious examination offence. Direct quotation from the work of others published or unpublished) must always be clearly identified as such by being placed in quotation marks, and a full reference to the source must be provided. Students are advised to pay attention to the quality of their English. Sometimes a project containing good work is marred by a report, which is turgid, obscure and simply ungrammatical

SOME IMPORTANT POINTS FOR CARRYING OUT A PROJECT: The organizations or companies offer you a placement for project work out of good will or to get some useful work done. Usually the companies do not provide you everything required by you. You must settle this right in the beginning of your project with the business that what will you get from them and what you will have to arrange yourself.

Sometimes a complication arises due to the fact that the company considers some aspect of your project work confidential. If this is so, it is your responsibility to get whatever clearance is necessary from the organization right in the beginning as essential parts like system analysis &design, flowcharts etc. can not be missing from a project report.

Project Evaluation Guidelines.

The project is evaluated on the basis of following heads:

Presentation: 25% of total Marks

Viva: 20 % of total Marks

Thesis/Project Report: 30% of total Marks

Software Coding

Documentation: 10% of total Marks

Software: 15 % of total Marks

The following suggested guidelines must be followed in preparing the Final project Report:

Good quality white executive bond paper A4 size should be used for typing and duplication. Care should be taken to avoid smudging while duplicating the copies.

Page Specification: (Written paper and source code)

Left margin - 3.0 cms

Right margin- 2.0 cms Top

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Page numbers - All text pages as well as Program source code listing should be numbered at the bottom center of the pages.

Normal Body Text: Font Size: 12, Times New Roman, Double Spacing, Justified. 6 point above and below para spacing

Paragraph Heading Font Size: 14, Times New Roman, Underlined, Left Aligned. 12 point above & below spacing.

Chapter Heading Font Size: 20, Times New Roman, Centre Aligned, 30 point above and below spacing.

Coding Font Size: 10, Courier New, Normal

PROJECT REPORT FORMAT

1. Title Cover

2. Certificate from organization about your stay (Project Duration) at that place and about submission of work done under external guide at the place of training.

3. Certificate from your guide about the submission of work done under his/her guidance, Internal Supervisor.

4. Table of Contents, abstract of the project (abstract of actual work done).

5. A brief overview of the organization (regarding function area, location, division in which you are working, turnover)

6. Profile of problems assigned.

7. Study of existing system, if any.

8. System requirements

a. Function to be Provided

b. Product Definition

c. Problem Statement

d. Processing Environment: H/W, S/W.

e. Solution Strategy

f. Acceptance Criteria

9. Feasibility Analysis

10. Project Plan

a. Team Structure

b. Development Schedule

c. Programming Languages And Development Tools

11. System Requirement Specifications

a. Developing / Operating / Maintenance Environments

b. External Interface And Data Flows

c. User display and report format, user command summary

d. High level DFD and data dictionary

e. Functional and performance specifications

12. Design Phase

a. Detailed DFD's and structure diagrams

b. Data structures, database and file specifications

c. Pseudo Code

13. Test Plan

a. Functional, Performance, Stress tests etc.

14. Implementation / Conversion Plan

a. Project Legacy

b. Current status of project

c. Remaining areas of concern

d. Technical and managerial lessons learnt

e. Future recommendations

15. Bibliography

16. Source Code

Note: - The above is meant to serve as a guideline for preparation of the project report. The students may add to, modify or omit some of the above-mentioned points depending upon their relevance to the project and with the consultation of the project guide for the same. Joint project will be allowed and joint project report will be also being accepted. In case of Joint Project the team should not consist of more than 3 members. Individual project will be recognized and the student should highlight their contribution in a joint project report.

ACKNOWLEDGEMENTS

In the "Acknowledgement" page, the writer recognises his indebtedness for guidance and assistance of the thesis adviser and other members of the faculty. Courtesy demands that he also recognise specific contributions by other persons or institutions such as libraries and research foundations. Acknowledgements should be expressed simply, tastefully, and tactfully.

ANNEXURE

1. Brief background of the organisation where the student has developed the project.
2. Data Dictionary (This should give a catalogue of the data elements used in the system / sub system developed. The following are the details required. Write NA if NOT applicable :

   Data Name, Aliases, if any Length (Size) Type,

   Numeric, Alpha, Binary etc.

   List of abbreviations, Figures, Tables
3. References
4. Bibliography Website
5. Soft copy of the project on CD/Floppy

BIBLIOGRAPHY :(EXAMPLE)

1. D.L. Carney, J.I. Cochrane, "The 5ESS Switching System: Architectural Overview," *AT&T Technical Journal*, vol. **64 ,** no. **6** , July-August 1985, pp. 1339-1356.
2. A. Stevens, *C++ Database Development*, MIS Press, New York, 1992, p. 34.
3. J. Martin, *Computer Data-base Organization*, Prentice-Hall, Englewood Cliffs, NJ,1977, p. 53.
4. www. Ibm.com/in
5. www.intel.com/india

BINDING & COLOR CODE OF THE REPORT/THESIS

For MCA – VI Semester (Dissertation/Major Project work)

Hard *Bound Report*

Background of the cover page – Black with letters in Golden

Department of Computer Applications
Course Structure for MCA Program
Batch: 2016-18

CERTIFICATE

This is to certify that this project entitled " _____" submitted in partial fulfillment of the degree of **MCA (Master Of Computer Applications)** to DIT University, Dehradun ,done by Mr./Ms._____, Roll No. _____ is an authentic work carried out by him/her at _____ under my guidance. The matter embodied in this project work has not been submitted earlier for award of any degree or diploma to the best of my knowledge and belief.

Name & Signature of the Guide

SELF CERTIFICATE

This is to certify that the dissertation/ project report entitled "_____" is done by me is an authentic work carried out for the partial fulfillment of the requirements for the award of the degree of **MCA (Master of Computer Applications)** under the guidance of _____. The matter embodied in this project work has not been submitted earlier for award of any degree or diploma to the best of my knowledge and belief.

Signature of the student

Name of the Student

Roll No.

Department of Computer Applications
Course Structure for MCA Program
Batch: 2016-18

Title of the report

(Times New Roman, Italic, Font size = 24)

Submitted in partial fulfillment of the requirements for the award of the degree of **MCA (Master of Computer Applications) (**Bookman Old Style, 16 point, centre)

DIT University LOGO

Guide

(Guide Name)

Submitted by:

(Student's name)

Roll No.:

Submitted To

DIT University, Dehradun

Department of Civil Engineering
DIT University Dehradun

Course Structure & Syllabus
for
Pre Ph.D. (CE) Course Work
Session: 2016-17

Pre Ph.D (CE)

S. No.	Course Code	Course Name	L	T	P	Credits
1	GBG010	Research Methods	4	0	0	4
2	CBB660	Ground Improvement Techniques	4	0	0	4
3	CBC680	Dynamic of Earth & Environment	4	0	0	4
5	CEZ110	Seminar	0	0	2	1

Pre Ph.D (CE)

Course Title: **Research Methods**			Course Code: **GBG010**
Credit: 4	L **4**	T **0**	P **0**
Year: **1st**			Semester: **I/II**

UNIT 1: RESEARCH: MEANING AND SCOPE (5 Hrs)

Philosophy and Meaning of Research, Nature and Scope of Research, Nature of inquiry in Physical Science and Social Sciences, Difference between writing a popular article and research paper, Difference between writing a book and a dissertation

UNIT 2: **RESEARCH-METHODOLOGY AND APPROACHES (10 Hrs)**

Selection of Research Topic, Plan of Work, Thesis Statement and its Feasibility, Survey of different critical approaches, Selection of a particular approach, Micro and Macro analysis, The identification of the Research Problem, Problem of plagiarism, Material Collection: Primary and Secondary Sources, Reliability of Sources

UNIT 3: **PREPARATORY STEPS (7 Hrs)**

Writing the Synopsis, Literature Survey, The search for facts; the verification of facts, the analysis of evidence, trusty and causation, sources if prejudice and bias, Collection, Listing and Organization of Material, Library references; note- making, Use of Note-Cards and Reference Cards.

UNIT 4: **ESSENTIALS OF THESIS-WRITING (13 Hrs)**

Format and the Structure of a thesis, Single and Multi-Tier Division of Chapters, Writing of the Main Chapters, Preparation and Presentation of Conclusions, Foot Notes, Bibliography, Index, Quotation & Translation, Style: Paragraphing: Mechanics of Writing, The stylistics of thesis writing, Preparation of Manuscript and References, Proof reading, Documentation, Use of MLA Style Sheet

TEXT BOOK

1. The Art of Literary Research, R.D. Altick and J.J. Fenstermaker. The University of Michigan, 1963.
2. The MLA Style Sheet- recent edition.

REFERENCE BOOKS

1. The Craft of Research, Booth and Colomb. Chicago Guides to Writing, Editing, and Publishing.
2. Methodology and Methods of Linguistic Research, I.P. Ranspopov.
3. Literary Research Guide, J.L.Harner.2nd edn. New York Press, 1993.
4. Handbook of Literary Research, R.H. Miller. The Scarecrow Press, 1995.
5. G. Watson- The Literary Thesis
6. Jaeques Barzun and Henry F. Graft. The Modern Researcher, New York, Harcorurt, Brace & World, 1962.

Pre Ph.D (CE)

Course Title: **Ground Improvement Techniques**			Course Code: **CBB660**
Credit: **4.0**	L **4**	T **0**	P **0**
Year: **1st**			Semester: **I/II**

UNIT 1:

Dewatering and Drainage Mechanism: Introduction- Scope and necessity of Ground improvement in geotechnical engineering, Classification of Ground Improvement Technique; Basic concepts of Drainage-Groundwater and Seepage control, Methods of Dewatering System, Drains.

UNIT 2:

Compaction and Vertical Drain: Introduction, Methods of compaction, Moisture-Density relationship, engineering behaviour of compacted fine- grained soils, Compaction control tests, liquefaction of soils and its remedial measures; Compressibility of soil and consolidation; preloading methods, concepts of vertical drains.

UNIT 3:

Grouting and Stabilization: Grouting- types of grout, aspects of grouting, grouting procedure, field equipment, application, requirements of soil stabilization, mechanical stabilization, Portland cement stabilization, bituminous (cementing) stabilization, chemical stabilization, thermal methods of stabilization.

UNIT 4:

Geosynthetics: Introduction, geosynthetic types, properties of geosynthetics, application of geosynthetics.

UNIT 5:

Soil reinforcement: Ground anchors, components of anchor, rock bolt, soil nailing, types of failure of soil nailed walls, stone columns, sand columns, soil-lime columns, Application of soil reinforcement in ground improvement.

Learning Outcomes: Students will be able to appreciate the advantages ground improvement methods from structural Engineering perspective

Text Books

1. Orlando B. A. (1994). "Introduction To Frozen Ground Engineering", CHAPMAN & HALL, NEW YORK.
2. "Ground Engineering". The Institute of Civil Engineers, London, 1970
3. Rawlings,C G, Hellawell,E. E. and Kilkenny,W. M.(2000). "Grouting For Ground Engineering ", CIRIA, LONDON

Reference Books

- Koerner, R. M. (1990). "Designing With Geosynthetics", PRENTICE-HALL.
- Wood, I. R. (1982). "Vertical Drains", THOMAS TELFORD.
- Davics, M. C. and Schlosser, F. (1997). "Ground Improvement Geosystems", THOMAS TELFORD, London
- Moseley, M. P. (1993). "Ground Improvement", BLACKIE ACADEMIC & PROFESSIONAL, LONDON.
- Hausmann, M. R.(1990). "Principles of Ground Modifications", McGraw-Hill Singapore.

Som, N & Das, S. P(2003). "Theory and practice of Foundation Design", Eastern Economy Edition, India.

Pre Ph.D (CE)

Course Title: **Dynamics of Earth and Environment**			Course Code: **CBC680**
Credit: **4.0**	L	T	P
	4	**0**	**0**
Year: **1st**			Semester: **I/II**

UNIT 1:

Fundamentals of Atmospheric circulations: Atmosphere and it structure, Vertical profile, lapse rate, moving coordinate system, El Nino-La Nina events, Walker circulation, Madden Julian Oscillation, concepts of land sea breezes, cyclones and their formation, Indian Monsoon, Paleoclimate,

UNIT 2:

Ground water and Engineering geology: Different types of aquifers, groundwater equations, Darcy‟s Law, porosity, permeability, soil types, stress, strain, artificial recharge, rainwater harvesting, Infiltration gallery, rock strength measurements.

UNIT 3:

Ocean dynamics: Ocean physical properties, Navier stokes' equations, stability, Brunt Vaissala frequency, concept of tides, Indian Ocean dipole, global ocean currents, Western boundary currents. Planetary waves. Barotropic and baroclinic waves, Geopotential. Tsunami.

UNIT 4:

Stratigraphy and basin analysis: Concepts and principles, Lithostratigraphy, Tectonic subsidence, basin forming processes, basin margins, Various logging tools and log charatcteristics.

UNIT 5:

Remote sensing and Isotope geology: Electromagnetic spectrum, synthetic aperture radar, active and passive sensors, radar technology, Sensor characteristics, different dating methods, carbon dating, optical luminescence dating, corrections

Department of Computer Science & Engineering
DIT University Dehradun

Course Structure & Syllabus
for
Pre Ph.D. (CSE) Course Work
Session: 2015-16

Pre Ph.D (CSE)

S. No.	Course Code	Course Name	L	T	P	Credits
1	GBG010	Research Methods	4	0	0	4
2		Elective 1	4	0	0	4
3		Elective 2	4	0	0	4
5	DEZ110	Seminar	0	0	2	1

List of Elective

S.No.	Subject Code	Course
1	DEZ630	Fuzzy Logic and Genetic Algorithms
2	DCA050	Advanced Computer Networks
3	DCB620	Digital Image Processing
4	DCB670	Cryptography
5	DCB680	Cloud Technologies
6	DCC010	Distributed Systems
7	DCC610	Information & Coding Theory
8	DCC620	Mobile and Ad-Hoc Networks
9	DCC630	Advanced Data Warehousing and Mining
10	DCC640	Big Data Analytics
11	DCB690	Neural Networks & Probabilistic Reasoning

Pre Ph.D (CSE)

Course Title: Research Methods	Course Code: GBG010
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: **I/II**

UNIT 1: RESEARCH: MEANING AND SCOPE (5 Hrs)

Philosophy and Meaning of Research, Nature and Scope of Research, Nature of inquiry in Physical Science and Social Sciences, Difference between writing a popular article and research paper, Difference between writing a book and a dissertation

UNIT 2: RESEARCH-METHODOLOGY AND APPROACHES (10 Hrs)

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UNIT 3: PREPARATORY STEPS (7 Hrs)

Writing the Synopsis, Literature Survey, The search for facts; the verification of facts, the analysis of evidence, trusty and causation, sources if prejudice and bias, Collection, Listing and Organization of Material, Library references; note- making, Use of Note-Cards and Reference Cards.

UNIT 4: ESSENTIALS OF THESIS-WRITING (13 Hrs)

Format and the Structure of a thesis, Single and Multi-Tier Division of Chapters, Writing of the Main Chapters, Preparation and Presentation of Conclusions, Foot Notes, Bibliography, Index, Quotation & Translation, Style: Paragraphing: Mechanics of Writing, The stylistics of thesis writing, Preparation of Manuscript and References, Proof reading, Documentation, Use of MLA Style Sheet

TEXT BOOK

1. The Art of Literary Research, R.D. Altick and J.J. Fenstermaker. The University of Michigan, 1963.
2. The MLA Style Sheet- recent edition.

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4. Handbook of Literary Research, R.H. Miller. The Scarecrow Press, 1995.
5. G. Watson- The Literary Thesis
6. Jaeques Barzun and Henry F. Graft. The Modern Researcher, New York, Harcorurt, Brace & World, 1962.

Pre Ph.D (CSE)

Course Title: Fuzzy Logic and Genetic Algorithm	Course Code: DEZ630
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: **I/II**

UNIT 1 **(8L)**

Fuzzy Sets (Introduction)

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory, Basic operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

UNIT2 **(8L)**

Fuzzy Logic (Fuzzy Membership, Rules)

Membership functions, Propositional logic and predicate logic, Inference in fuzzy logic, Fuzzy if-then rules, Fuzzy mapping rules, Fuzzy implications, Min-Max Theorem, Resolution Rule under Fuzzy environment, Refutation method for theorem proving, Defuzzifications.

UNIT3 **(8L)**

Reasoning with uncertain and incomplete information: The statistical approach to uncertainty, Introduction, Uncertain & incomplete knowledge. Review of Probability theory.

UNIT4 **(8L)**

Bayes Theorem, Bayesian Networks, Bayesian reasoning. Decision Making, Joint Probabilities, Relationships, Polytrees., Dempster-Shafer theory of evidence, Certainty Factor, Non-monotonic systems.

UNIT 5 **(8L))**

Theoretical Foundation of Genetic Algorithms

Introduction: Basic Operators: Reproduction, Crossover & Mutation. Fitness function. Search Space, Schemas & Two-Armed and k-armed problem, Exact mathematical models, Applications of Genetic Algorithms.

Text Book:

1. G.J.Klir , Yuan,"Fuzzy Sets and fuzzy logic, Theory and applications", Prentice Hall India, 1995.
2. David E. Goldberg, "Genetic algorithms in search, optimization & Machine Learning" Pearson Education, 2006
3. Stuart Russel, Peter Norvig, "Artificial Intelligence A Modern Approach" Pearson (3rd Ed.)

Reference Book:

1. John Yen, Reza Langari, "Fuzzy Logic Intelligence, Control and Information", Pearson Education, 2006.
2. Timothy J Ross, "Fuzzy Logic with Engineering Applications", 2nd Edition, John Wiley, 2004.
3. H. Zimmermann, "Fuzzy Set Theory and its applications", 2nd Edition, Allied Publishers, 1996.
4. Melanle Mitchell, "An introduction to genetic algorithms", Prentice Hall India, 2002.

Pre Ph.D (CSE)

Course Title: Advanced Computer Networks	Course Code: DCB610
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: **I/II**

Unit I **(8 L)**

Network Layer design Issues, IPv4, IPv6, Shortest Path Routing, Distance Vector Routing, Flooding, Hierarchical Routing, Broadcast Routing, Multicast Routing.

Unit II **(8 L)**

Wireless Networks, GSM Architecture, CDMA, Mobility in networks, Handoffs. Mobile IP- IP Packet Delivery, Agent Discovery, Registration, Tunneling and Encapsulation.

Unit III **(8 L)**

Mobile TCP- Traditional TCP (Congestion Control, Slow Start, Fast Retransmit/Fast Recovery), Indirect TCP, Snooping TCP, Mobile TCP, Selective Retransmission, Transaction Oriented TCP.

Unit IV **(8 L)**

Wireless LAN- Infrared Vs Radio Transmission, Infrastructure and Ad-hoc Network, IEEE 802.11-System Architecture, Protocol Architecture, Physical Layer, Bluetooth.

Unit V **(8 L)**

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management, SSL.

Text Book:

1. Jochen Schiller"Mobile "Communications".

2. Andrew S. Tanenbaum ,"Computer Networks," Pearson Education

Reference Book:

1. Forouzan, B.A., Data communication and Networking, McGraw Hill (2006) 4th ed.

Pre Ph.D (CSE)

Course Title: Digital Image Processing	Course Code: DCB620
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: **I/II**

Unit I **(8 L)**

Introduction and Fundamentals

Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Spatial Domain

Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

Unit II **(8 L)**

Image Enhancement in Frequency Domain

Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

Image Restoration

A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

Unit III **(8 L)**

Color Image Processing

Color Fundamentals, Color Models, Converting Colors to different models, Color Transformation, Smoothing and Sharpening, Color Segmentation.

Morphological Image Processing: Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

Unit IV **(8 L)**

Registration:

Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation: Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

Unit V **(8 L)**

Feature Extraction: Representation, Topological Attributes, Geometric Attributes Description,Boundary-based Description, Region-based Description and Relationship.

Object Recognition: Deterministic Methods, Clustering, Statistical Classification, Syntactic Recognition, Tree Search, Graph Matching

Text Book:

1. Rafael C. Gonzalvez and Richard E.Woods, Digital Image Processing 2nd Edition , Pearson Education.

Reference Book:

1. R.J. Schalkoff. ,Digital Image Processing and Computer Vision ,John Wiley and Sons, NY.

2. A.K. Jain. , Fundamentals of Digital Image Processing, ,Prentice Hall, Upper Saddle River, NJ.

Pre Ph.D (CSE)

Course Title: Cryptography	Course Code: DCB670
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: **I/II**

UNIT I **(8 L)**

Introduction to Security in Networks, Characteristics of Networks, Intrusion, Kinds of security breaches, Plan of attack, Points of vulnerability, Methods of defense, Control measures, Effectiveness of controls.

UNIT II **(9 L)**

Basic encryption and decryption, Encryption techniques, Characteristics of good encryption Systems, Secret key cryptography, Data Encryption Standard, International Data Encryption Algorithm, Advanced Encryption Standard.

UNIT III **(8 L)**

Public Key encryptions, Introduction to number theory, RSA algorithm, Diffie-Hellman, Digital Signature standard, Elliptic Curve cryptography, Digital signatures and authentication Trusted intermediaries, Security handshake pitfalls, Hash and MAC algorithms, Security standards, Kerberos.X.509AuthenticationService

UNIT IV **(8 L)**

Secure sockets, IPsec overview, IP security architecture, IPsec-Internet Key Exchanging (IKE) , IKE phases ,encoding , Internet security ,Threats to privacy ,Packet sniffing, Spoofing , Web security requirements , Real Time communication security .

UNIT V **(7 L)**

Secret Sharing Schemes, The Shamir Threshold Scheme, Access Structure and General Secret key sharing, Information Rate and Construction of Efficient Schemes, Multicast Security and Copyright production-Multicast Security, Broadcast Encryption ,Multicast Rekeying, Copyright Protection ,Tracing Illegally Redistribution keys.

Text Book:

1. William Stallings, "Cryptography and Network Security: Principles and Standards", Prentice Hall India, 3rd Edition, 2003.

2. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security: Private Communication in a public world", Prentice Hall India, 2nd Edition, 2002.

Reference Book:

1. Charles P. Pleeger, "Security in Computing", Pearson Education Asia, 5th Edition, 2001.

2. William Stallings, "Network Security Essentials: Applications and standards", Person Education Asia, 2000.

Pre Ph.D (CSE)

Course Title: Cloud Technologies	Course Code: DEZ620
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: **I/II**

Unit I **(8 L)**

Fundamentals of Cloud Computing: What it is & what it is not?, The old IT infrastructure versus the cloud, www, Internet, Cloud and cloud computing, Motivation for Cloud Computing, A comparison of IT infrastructure options, Historical developments: Client-Server computing, Peer to Peer Computing, Distributed Computing, Cluster & Grid Computing, Principals of parallel and distributed computing- Eras of computing, parallel vs. Distributed computing, Elements of parallel of computing, Elements of Distributed of computing, Technologies of distributed computing: Service oriented computing and architecture.

Unit II **(9 L)**

Introduction to High performance computing, Technical foundations of Cloud Computing, Goals of Cloud Computing, Resource Sharing at various levels, Cloud Architecture, NIST USA Cloud Computing Model: Essential Characteristics, Delivery Models, IaaS, PaaS, Saas, Deployment Models, Public, private, Hybrid & Community, Pricing Model of Cloud Computing, Advantages & Disadvantages of Cloud Computing, Open challenges: Cloud definition, cloud interoperability and standards, scalability and fault tolerance, Security, trust and privacy, Organizational aspects.

Unit III **(8 L)**

Companies in Cloud Computing, Cloud computing Engines- GAE, EC2, Microsoft Azure, Virtualization: Characteristics of virtualized environment, taxonomy of virtualization techniques, Virtualization and cloud computing, pros and cons of virtualization, Technology examples, Flex Tenancy architecture, Pros & Cons of Cloud service development, Cloud application development, Cloud computing applications, Cloud Computing for everyone, Computing for Community & corporate.

Unit IV **(8 L)**

Security: Securing the cloud-The security boundary, Security service boundary, security mapping, Data security- Brokered cloud storage access, storage location and tenancy, encryption, Auditing and compliance, Establishing identity and presence, Network security, Host security, compromise response, High-throughput computing: Task programming.

Unit V **(9 L)**

Advanced topics in cloud computing: energy efficiency in clouds, market based management of clouds-market oriented cloud computing; A reference model of MOCC technologies and initiatives supporting MOCC, Federated clouds / InterClouds, Third party cloud services- Meta CDN; SpotCloud, Using the mobile cloud.

Text Book:

1. R. Buyya, C. Vecchiola, S. T. Selvi, Matering Cloud Computing, Ed. Third reprint 2013, Mc Graw Hill education (India) Pvt. Ltd.
2. B. Sosinsky, Cloud computing Bible, Ed. Reprint 2014, Willy India Pvt. Ltd.

Reference Book:

1. M. Miller, Cloud Computing, Ed. 9th 2014, Pearson education in South Asia.

Pre Ph.D (CSE)

Course Title: Distributed Systems	Course Code: DCB630
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: **I/II**

Unit I **(8 L)**

Fundamentals of Distributed Computing: Architectural models for distributed computing systems, Issues and challenges in Distributed systems, Basic concepts in distributed computing such as clocks, message ordering, consistent global states.

Distributed Environments

Current systems and developments (DCE, CORBA, JAVA).

Unit II **(8 L)**

Coordination & Synchronization: Introduction, Distributed Mutual Exclusion, Elections, Multicast Communication, Atomic transactions, Deadlocks in Distributed systems.

Message Passing & Remote Procedure Calls: Features of a good message-passing system, RPC model. Implementing RPC mechanism, Stub Generation, RPC Messages, Marshaling Arguments and Results, Server Management, Communication protocols for RPCs.

Unit III **(8 L)**

Distributed File Systems: Features of Good DFS, File Models, File-Accessing models, File Service Architecture, File-sharing semantics, File Caching schemes, File replications.

Unit IV **(8 L)**

Distributed Shared Memory: Shared memory consistency models, Page based distributed shared memory, Shared variable distributed shared memory, Object based distributed shared memory.

Replication: Introduction, System Model & Group Communication, Fault Tolerant Services, Transactions with Replicated Data.

Unit V **(8 L)**

Advanced Topics in Distributed Computing: High Performance Computing-HPF, Distributed and mobile multimedia systems. Adaptability in Mobile Computing. Grid Computing and applications. Fault tolerant Computing Systems.

Text Book:

1. Tannenbaum, A, Van Steen, Distributed Systems, Principles and Paradigm,. Prentice Hall India, 2002
2. Tannenbaum, Distributed Operating Systems, A. Pearson Education. 2006
3. Attiya, Welch, "Distributed Computing", Wiley India, 2006

Reference Book:

1. Singhal and Shivaratri, "Advanced Concepts in Operating Systems", McGraw Hill, 1994

Pre Ph.D (CSE)

Course Title: Information & Coding Theory	Course Code: DCB640
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: **I/II**

Unit I INFORMATION THEORY **(8 L)**

Information-Entropy, Information rate, classification of codes, Kraft McMillan inequality, Source coding theorem, Shannon-Fano coding, Huffman coding, Extended Huffman coding -Joint and conditional entropies, Mutual information - Discrete memory less channels – BSC,BEC – Channel capacity, Shannon limit.

Unit II SOURCE CODING: TEXT, AUDIO AND SPEECH **(8 L)**

Text: Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm Audio: Perceptual coding, Masking techniques, Psychoacoustic model, MEG Audio layers I,II,III, Dolby AC3 Speech: Channel Vocoder, Linear Predictive Coding

Unit III SOURCE CODING: IMAGE AND VIDEO **(8 L)**

Image and Video Formats – GIF, TIFF, SIF, CIF, QCIF Image compression: READ, JPEG.Video Compression: Principles-I,B,P frames, Motion estimation, Motion compensation,H.261, MPEG standard.

Unit IV ERROR CONTROL CODING: BLOCK CODES **(8 L)**

Definitions and Principles: Hamming weight, Hamming distance, Minimum distance decoding - Single parity codes, Hamming codes, Repetition codes - Linear block codes ,Cyclic codes - Syndrome calculation, Encoder and decoder - CRC

Unit V ERROR CONTROL CODING: CONVOLUTIONAL CODES **(8 L)**

Convolutional codes– code tree, trellis, state diagram - Encoding – Decoding: Sequential search and Viterbi algorithm – Principle of Turbo coding

Text Book:

1. R Bose, "Information Theory, Coding and Cryptography", TMH 2007
2. FredHalsall ,"Multimedia Communications: Applications, Networks, protocols and Standards", Perason Education Asia, 2002 .

Reference Book:

1. ,Steven Roman ,Introduction to Coding and Information Theory.
2. T. M. Cover and J. A. Thomas, Elements of Information Theory, 2nd ed. Wiley Interscience, 2006 .

Pre Ph.D (CSE)

Course Title: Mobile and Ad-Hoc Network	Course Code: DCB650
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: **I/II**

Unit I **(8 L)**

Issues in Mobile Computing, Wireless Telephony: Frequency Reuse, Cell Design, Cellular Architecture. Digital Cellular Standards, GSM: Air-Interface, Channel Structure, Location Management: HLR- VLR, Handoffs , Channel allocation in Cellular Systems, CDMA, GPRS, EDGE, Overview of 3G Cellular Networks.

Unit II **(8 L)**

Wireless Networking, WLAN Overview, Infrared LAN, Spread-Spectrum LAN, Narrowband Microwave LAN, MAC issues, Wireless Multiple Access Protocols, MACA & MACAW, IEEE 802.11 variants, IEEE 802.16, Bluetooth, Wireless Metropolitan Area Networks (Wireless Local Loop)

Unit III **(8 L)**

Wireless Internet: IP Limitations, Mobile IP & its working, Issues in Mobile IP. TCP over Wireless, Wireless Access Protocol (WAP): Architecture & Protocol Stack. Security in Wireless Systems, Mobile Agents Computing, Transaction Processing in Mobile Computing Environment

Unit IV **(8 L)**

Ad Hoc Networks: Ad Hoc Networks vs. Cellular Networks, Issues in Ad Hoc Wireless Networks, MAC Protocols, Routing Protocols for Ad Hoc Wireless Networks-Design Issues and Classification, Proactive Routing Protocols, Reactive Routing Protocols, Hybrid Routing Protocols.

Unit V **(8 L)**

Wireless Sensor Networks: Overview, Application Areas, Sensor Nodes' Architecture, Data Aggregation, Routing, and Query Processing in WSN.

Text Book:

1. Jochen H. Schiller, Mobile Communication, Addison-Wesley, Pearson Education
2. Sipra Das Bit, Biplab K. Sikdar, Mobile Computing, PHI Learning
3. Vijay Garg, Elsevier,Wireless Communication & Networking , Morgan Kaufmann Publisher

Reference Book:

1. Subir K Sarkar, T G Basavaraju, C Puttamadappa, Ad Hoc Mobile Wireless Networks, Auerbach Publication.

2. A. Ananda, Mun Choon Chan, Mobile, Wireless & Sensor Networks, Wei Tsang Ooi , IEEE press, Willy Inter sciences.

Pre Ph.D (CSE)

Course Title: Advanced Data Warehousing and Mining	Course Code: DCB010		
Credit: 4	L	T	P
	4	**0**	**0**
Year: **1st**	Semester: **I/II**		

Unit I **(8 L)**

Evolution of Database System Technology, Architecture of Data Mining System, Data Warehouse, Advanced Data and Information Systems and Advanced Applications, Data Mining Functionalities, Data Mining Task Primitives

Unit II **(8 L)**

Data Preprocessing, Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation

Unit III **(8 L)**

Data Warehouse Architecture, Data Warehouse Schemas, Multidimensional Data Model, OLTP, OLAP, OLAP operations, ROLAP, MOLAP, HOLAP

Unit IV **(8 L)**

Market Basket Analysis, Apriori Algorithm, Mining Multilevel Association Rules, Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back propagation

Unit V **(8 L)**

Cluster Analysis, Types of Data in Cluster Analysis, Partitioning Methods, K-Means Method, K-Medoids Method, DBSCAN, OPTICS.Mining Sequence pattern in Biological Data, Mining Multidimensional, Multilevel Sequential Pattern

Text Book:

1. Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques".,

Reference Book:

1. M.H.Dunham, "Data Mining: Introductory and Advanced Topics" , Pearson Education

2. Mallach ,Data Warehousing System McGraw –Hill

3. Alex Berson and Stephen J. Smith, "Data Warehousing, Data mining and OLAP", Tata McGraw-Hill, 2004.

Pre Ph.D (CSE)

Course Title: Big Data Analytics	Course Code: DCC640		
Credit: 4	L	T	P
	4	**0**	**0**
Year: **1st**	Semester: **I/II**		

Unit 1 Introduction **(8 L)**

Examples, data science articulated, history and context, technology landscape.

Unit 2 Data Manipulation at Scale **(8 L)**

Databases and the relational algebra ,Parallel databases, parallel query processing, in-database analytics ,MapReduce, Hadoop, relationship to databases, algorithms, extensions, languages ,Key-value stores and NoSQL; tradeoffs of SQL and NoSQL

Unit 3 Analytics **(8 L)**

Topics in statistical modeling: basic concepts, experiment design, pitfalls, Topics in machine learning: supervised learning (rules, trees, forests, nearest neighbor, regression), optimization (gradient descent and variants), unsupervised learning.

Unit 4 Communicating Results **(7 L)**

Visualization, data products, visual data analytics, Provenance, privacy, ethics, governance.

Unit 5 Special Topics **(9 L)**

Graph Analytics: structure, traversals, analytics, PageRank, community detection, recursive queries semantic web.

Text Book:

1- Mayer-Schönberger, V., & Cukier, K. (2013). *Big Data: A Revolution That Will Transform How We Live, Work, and Think*. Boston: Houghton Miffin Harcourt.

Reference Book:

1- Frank J. Olhorst Big Data Analytics: Turning Big Data into Big Money (Wiley and SAS Business Series)

Pre Ph.D (CSE)

Course Title: **Neural Networks & Probabilistic Reasoning**	Course Code: DCB690
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: **I/II**

Unit I **(8 L)**

Introduction: Biological neural system, Artificial Intelligent Systems, Modeling human performance. Uncertain & incomplete knowledge, Expert Systems Vs Neural Networks.

Unit II **(8 L)**

Foundations for connectionist networks. Architecture, Activation functions, Characteristics of Neural Networks, McCulloch-Pitts Neurons, Liner Separability

Unit III **(8 L)**

Perceptron learning, Pattern Classification. Hebb Rule. Adaline. Madaline. Delta Rule.Back propagation learning, Competitive learning, Hebbian learning, BAMs.

Unit IV **(8 L)**

Supervised and Unsupervised learning. Reinforcement learning, Kohonen Self Organizing

Maps, Applications of SOMs ,Adaptive Resonance Theory, Neural Network Applications.

Unit V **(8 L)**

Neuro-Fuzzy Systems: Types of Fuzzy Neural Nets, Neural components in a Fuzzy System

Fuzzy-ANN Controller, Support Vector Machines, Applications of SVMs.

Text Book:

1. Simon Haykin, "Neural Networks: A Comprehensive Foundation", Prentice Hall

2. Nils J. Nilsson, "Artificial Intelligence - A New Synthesis", Morgan Kaufmann Publishers.

3. Robert J. Scholkoof "Artificial Neural Networks"; McGraw Hill Education, 2011

Reference Book:

1. "Fuzzy Logic with Engineering Applications" ,Timothy J. Ross, Wiley India.

2. "Artificial Intelligence A Modern Approach" ,Stuart Russel, Peter Norvig, Pearson (3rd Ed.)

Department of Electronics & Communication Engineering
DIT University Dehradun

Course Structure & Syllabus
for
Pre Ph.D. (ECE) Course Work
Session: 2016-17

Pre Ph.D (ECE)

Sr. No.	Course Code	Course Title	L	T	P	Credit
1	GBG010	Research Methodology	4	0	0	4
2		Elective 1	4	0	0	4
3		Elective 2	4	0	0	4
4		Elective 3	4	0	0	4
5	FDZ110	Seminar	0	0	2	1
		Total Credits				**17**

List of Electives

S.No.	Subject Code	Course
1	FDZ610	Introduction to Meta-materials
2	FDZ620	Applications of Meta-materials in Microstrip Patch and Leaky-Wave Antennas
3	FDZ630	Microwave Circuits and their Simulation Techniques
4	FDZ640	Algorithms for Control Systems
5	FDZ650	Digital Signal Processing and Algorithms
6	FDZ660	Image Processing – Digital and Optical Methods
7	FDZ670	Artificial Intelligence
8	FDZ680	Data Structures and Algorithms
9	FDZ690	VLSI Design and Test Flow
10	FDZ6A0	System on Chip (SoC) Design and Test
11	FDZ6B0	Digital Circuit Design
12	FDZ6C0	Design of Testability 1
13	FDZ6E0	Nano-technology and its Applications
14	FDZ6F0	Characterization Tools for Materials

Note : Apart from above listed Elective courses, Research Scholar may choose any course across departments being offered at PG level, if it is required/suggested by the Research Committee.

Course Title: **Research Methodology**	Course Code: **GBG010**
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: I/II

UNIT – I

Fundamentals of Research: Defining research, Objectives of research, types, research process, deductive and inductive reasoning;

Identifying and formulating a research problem, Literature review: Search for existing literature (World Wide Web, Online data bases), Review the literature selected (Case studies, review articles and Meta-analysis), Develop a theoretical and conceptual framework, Writing up the review,

Definition of variables: Concepts, indicators and variables, Types of variables, Types of measurement scales, Constructing the Hypothesis- Null(Research) and alternative, one-tailed and two-tailed testing, errors in testing. Ethical and Moral Issues in Research, Plagiarism, tools to avoid plagiarism – Intellectual Property Rights – Copy right laws – Patent rights

UNIT – II

Research Design: Design of Experiments: Research Designs -Exploratory, Descriptive and Experimental, Experimental designs- Types of Experimental Designs

UNIT – III

Sampling, Sampling distribution, and Data Collection: Sampling distribution, Normal and binomial distribution, Reasons for sampling, sampling technique, sampling errors.Sources of Data-Primary Data, Secondary Data, Data Collection methods

UNIT – IV

Statistical Data Analysis: Descriptive and inferential statistical analysis. Testing of hypothesis with Z-test, T-test and its variants, Chi-square test, ANOVA, Correlation, Regression Analysis, Introduction to data analysis data using SPSS20.0

UNIT – V

Research Report: Writing a research report- Developing an outline, Formats of Report writing, Key elements-Objective, Introduction, Design or Rationale of work, Experimental Methods, Procedures, Measurements, Results, Discussion, Conclusion, Referencing and various formats for reference writing of books and research papers, Writing a Research Proposal.

Books Recommended:

1. Ganesan R, Research Methodology for Engineers , MJP Publishers, Chennai. 2011
2. C.R.Kothari, "Research Methodology", 5th edition, New Age Publication,
3. Cooper, "Business Research Methods", 9th edition, Tata McGraw hills publication
4. Walpole R.A., Myers R.H., Myers S.L. and Ye, King: Probability & Statistics for Engineers and Scientists, Pearson Prentice Hall, Pearson Education, Inc. 2007.
5. Anderson B.H., Dursaton, and Poole M.: Thesis and assignment writing, Wiley Eastern 1997.
6. Bordens K.S. and Abbott, B.b.: Research Design and Methods, McGraw Hill, 2008.
7. Morris R Cohen: An Introduction to logic and Scientific Method (Allied Publishers) – P 197-222; 391–403

Course Title: **Introduction to Metamaterials**	Course Code: **FDZ610**
Credit: 4	L **4** T **0** P **0**
Year: 1st	Semester: I/II

Module 1: Introduction: Definition of Metamaterials (MTMs) and Left-Handed (LH) MTMs, Theoretical Speculation by Viktor Veselago, Experimental Demonstration of Left-Handedness, Further Numerical and Experimental Confirmations, Conventional Backward Waves and Novelty of LH MTMs, Terminology, Transmission Line (TL) Approach, Composite Right/Left-Handed (CRLH) MTMs, MTMs and Photonic Band-Gap (PBG) Structures, Historical "Germs" of MTMs.

Module 2: Fundamental of LH MTMs: Left-Handedness from Maxwell's Equations, Entropy Conditions in Dispersive Media, Boundary Conditions, Reversal of Doppler Effect, Reversal of Vavilov-Cerenkov Radiation, Reversal of Snell's Law: Negative Refraction, Focusing by a "Flat LH Lens", Fresnel Coefficients, Reversal of Goos-H¨anchenEffect, Reversal of Convergence and Divergence in Convex and Concave Lenses, Sub-wavelength Diffraction.

Module 3: TL Theory of MTMs: Ideal Homogeneous CRLH TLs: Fundamental TL Characteristics, Equivalent MTM Constitutive Parameters, Balanced and Unbalanced Resonances, Lossy Case, LC Network Implementation: Principle, Difference with Conventional Filters

Module 4:Transmission Matrix Analysis: Input Impedance, Cutoff Frequencies, Analytical Dispersion Relation, Bloch Impedance, Effect of Finite Size in the Presence of Imperfect Matching, Real Distributed 1D CRLH Structures: General Design Guidelines, Microstrip Implementation, Parameters Extraction; Experimental Transmission Characteristics, Conversion from Transmission Line to Constitutive Parameters

Module 5: Applications of Metamaterials: Perfect Lens, Transmission Line, MTM based Absorbers, Application in Antenna Fields

Reference Books:

1. Electromagnetic Metamaterials: Transmission line theory and microwave applications, The Engineering Approach by Christophe Caloz and Tatsuo Itoh.

Course Title: **Applications of Metamaterials**	Course Code: **FDZ620**
Credit: 4	L T P **4 0 0**
Year: 1st	Semester: I/II

Module 1: Application of MTMs to Microwave Patch: Review of the adopted terminology, Beating the diffraction limit through MTMs, Design of concept antennas loaded with MTMs, Planar patch antennas

Module 2: Leaky-Wave Antennas: Leaky-wave planar antennas, Leaky-wave cylindrical antennas, Real life implementation of miniaturized MTMs components, Leaky-wave antenna and MTM based leaky-wave antennas, Enhanced Directivity by using MTM Substrate

Module 3: Applications in optical frequency range: Enhanced transmission at optical frequencies, Introduction, Basics of EOT in periodic arrays, Optical Transmission through Slit Arrays, 2D Hole array

Module 4: Additional aspects of EOT: Influence of the metal, Dependence on hole shape, EOT in Quasi-periodic array, EOT in single aperture flanked by corrugations

Module 5: Other Applications: Perfect Lens, Transmission Line, MTM based Absorbers, Application in Antenna Fields

Reference Books:

1. Metamaterials Handbook: Applications of Metamaterials edited by FilippoCapolino.

Course Title: **Study of Microwave Circuits and their Simulation Techniques**	Course Code: **FDZ630**		
Credit: 4	L **4**	T **0**	P **0**
Year: 1st	Semester: I/II		

Module 1: Microwave Components: Microstrip Structures: Microstrip Lines, Microstrips; Lumped Elements: Resistance, Inductance, Capacitance; Wave-Guides: Rectangular Waveguides, Modes in RWG, Circular W, Modes in CWG; Metamaterial Unit Cell

Module 2: Equivalent Circuits for microwave components: EC of Microstrip Lines, EC of Microstrip Patch, EC of Lumped Elements, EC of Metamaterial Unit Cell

Module 3: Study of Simulation Software: Design Setup, Simulation Setup, Analyses, Optimization

Module 4: Designing of Microwave Components using Simulation software: Microstrip Line Design, Quarter Wave Transformer, Co-axial Cable Design, Design of Phase-shifter, Design of Microstrip Patch Antenna

Module 5: Designing Antenna Using HFSS: Designing and Simulation of Patch antenna with Co-axial feed, Designing and Simulation of Patch antenna with Microstrip feed, Designing and Simulation of Patch antenna with Aperture Coupled feed, Designing and Simulation of Patch antenna with Proximity feed

Reference:

1. George D. Vendelin, Anthony M. Pavio, Ulrich L. Rohde, Microwave Circuit Design Using Linear and Nonlinear Techniques, John Wiely& Sons, 2005
2. Daniel G. Swanson, Wolfgang J. R. Hoefer, Microwave Circuit Modeling Using Electromagnetic Field Simulation, Artech House, 2003

Course Title: **Control System Algorithms**	Course Code: **FDZ640**
Credit: 4	L T P **4 0 0**
Year: 1st	Semester: I/II

Module 1 : Model Based Controller Design- Introduction, Control structures and performance measures, Time and frequency domain performance measures, Design of controller, Design of controller for SISO system, Controller design for TITO processes, Limitations of PID controllers, PI-PD controller for SISO system, PID-P controller for Two Input Two Output system, Effects of measurement noise and load

Module 2: **Frequency Domain Based Identification-** Identification of dynamic models of plants, Relay control system for identification, Off-line identification of process dynamics, On-line identification of plant dynamics, State space based identification

Module 3 :Time Domain Based Identification- State space based identification, State space analysis of systems, State space based identification of systems, State space based identification of systems, Identification of simple systems, Identification of FOPDT model, Identification of second order plus dead time model, Identification of SOPDT model, Steady state gain from asymmetrical relay test, Identification of SOPDT model with pole multiplicity, Existence of limit cycle for unstable system,

Module 4: Identification procedures- Identification of underdamped systems Off-line identification of TITO systems, On-line identification of TITO systems, Review of time domain based identification, DF based analytical expressions for on-line identification, Model parameter accuracy and sensitivity, Improved identification using Fourier series and wavelet transform, Reviews of DF based identification

Module 5: Design of Controllers: Advanced Smith predictor controller, Design of controllers for the advanced Smith predictor, Model-free controller design, Model based PID controller design, Model based PI-PD controller design, Tuning of reconfigurable PID controllers.

Reference Books:

1. S. Majhi, Advanced Control Theory-Relay Feedback Approach, Cengage Asia/India Pvt.Ltd, 2009.
2. A. Johnson and H. Moradi, New Identifications and Design Methods, Springer - Verlag, 2005.
3. Norman S. Nise, Control Systems Engineering, John Wiley & Sons, 2008.

Course Title: **Digital Signal Processing & Algorithms**	Course Code: **FDZ650**
Credit: 4	L T P **4 0 0**
Year: 1st	Semester: I/II

Module 1*:*
Introduction of DFT & FFT Algorithms: Review of DFT and FFT (DIT and DIF of radix-2), Computational complexity of DFT-FFT Algorithms, Concept of linear transformation of Computations, Time and Frequency Characterization of DFT.

Module 2:
Review of Filter's Design: Applications of Z-transforms, solution of difference equations of digital filters, System function and Stability criterion. Frequency response of stable systems, Realization of digital filters -Direct, Canonic, Cascade and Parallel forms. Review of FIR and IIR filters design: Analog filter approximations - Butterworth and Chebyshev, Design of IIR Digital filters from analog filters. Step and Impulse invariant techniques, Bilinear transformation method, Characteristics of FIR Digital Filters. Frequency response, Linear Phase response of FIR Filter, Design of FIR Filters: Fourier Method, Digital filters using Window Techniques, Frequency Sampling technique.

Module 3:
Multirate Digital Signal Processing: Decimation by factor D and l, Sampling rate conversion, design and implementation for sampling rate conversions, poly-phase filter structure, and multistage implementation for sampling rate conversion, decimation and interpolation by frequency conversion, modulation free method for decimation and interpolation.

Module 4:
Adaptive Filtersand Transforms: Adaptive FIR filters and their algorithms, Applications of adaptive filters in Noise and Echo cancellation, System identifications, multirate signal processing, DCT, Wavlet Transforms, Weiner filter.

Module 5:
Applications: Multirate Signal Processing, Speech Compression, Musical Sound Processing, Image Enhancement.

Reference Books:
1. John G. Proakis & D G Manolakis, Digital Signal Processing – Principles, Algorithms and Applications, 4th Ed, Pearson Education 2007

Course Title: **Image Processing- Digital and Optical Methods**	Course Code: **FDZ660**
Credit: 4	L: **4** T: **0** P: **0**
Year: 1st	Semester: I/II

Module 1: Introduction: Light, Brightness adaption and discrimination, Pixels, coordinate conventions, Imaging Geometry, Perspective Projection, Spatial Domain Filtering, sampling andquantization.
Spatial Domain Filtering: Intensity transformations, contrast stretching, histogram equalization, Correlation and convolution, Smoothing filters, sharpening filters, gradient and Laplacian

Module 2: Filtering in the Frequency domain: Hotelling Transform, Fourier Transforms and properties, FFT (Decimation in Frequency and Decimation in Time Techniques), Convolution, Correlation, 2-D sampling, Discrete Cosine Transform, Frequency domain filtering.

Module 3: Image Restoration: Basic Framework, Interactive Restoration, Image deformation and geometric transformations, image morphing, Restoration techniques, Noise characterization, Noise restoration filters, Adaptive filters, Linear, Position invariant degradations, Estimation of Degradation functions, Restoration from projections.

Module 4: Image Compression: Encoder-Decoder model, Types of redundancies, Lossy and Lossless compression, Entropy of an information source, Shannon's 1st Theorem, Huffman Coding, Arithmetic Coding, Golomb Coding, LZW coding, Transform Coding, Sub-image size selection, blocking artifacts, DCT implementation using FFT, Run length coding, FAX compression (CCITT Group-3 and Group-4), Symbol-based coding, JBIG-2, Bit-plane encoding, Bit-allocation, Zonal Coding, Threshold Coding, JPEG, Lossless predictive coding, Lossy predictive coding, Motion Compensation
Wavelet based Image Compression : Expansion of functions, Multi-resolution analysis, Scaling functions, MRA refinement equation, Wavelet series expansion, Discrete Wavelet Transform (DWT), Continuous Wavelet Transform, Fast Wavelet Transform, 2-D wavelet Transform, JPEG-2000 encoding, Digital Image Watermarking.

Module 5: Morphological Image Processing: Basics, SE, Erosion, Dilation, Opening, Closing, Hit-or-Miss Transform, Boundary Detection, Hole filling, Connected components, convex hull, thinning, thickening, skeletons, pruning, Geodesic Dilation, Erosion, Reconstruction by dilation and erosion.
Image Segmentation: Boundary detection based techniques, Point, line detection, Edge detection, Edge linking, local processing, regional processing, Hough transform, Thresholding, Iterative thresholding, Otsu's method, Moving averages, Multivariable thresholding, Region-based segmentation, Watershed algorithm, Use of motion in segmentation

References Books:

1. Digital Image Processing, 3rd Edition, by Rafael C Gonzalez and Richard E Woods. Publisher: Pearson Education.

Course Title: **Artificial Intelligence**	Course Code: **FDZ670**
Credit: 4	L T P **4 0 0**
Year: 1st	Semester: I/II

Module 1:
Overview: foundations, scope, problems, and approaches of AI.
Intelligent agents: reactive, deliberative, goal-driven, utility-driven, and learning agents, Artificial Intelligence programming techniques

Module 2:
Problem-solving through Search: forward and backward, state-space, blind, heuristic, problem-reduction, A, A*, AO*, minimax, constraint propagation, neural, stochastic, and evolutionary search algorithms, sample applications.
Knowledge Representation and Reasoning: ontologies, foundations of knowledge representation and reasoning, representing and reasoning about objects, relations, events, actions, time, and space; predicate logic, situation calculus, description logics, reasoning with defaults, reasoning about knowledge, sample applications.

Module 3:
Planning: planning as search, partial order planning, construction and use of planning graphs
Representing and Reasoning with Uncertain Knowledge: probability, connection to logic, independence, Bayes rule, Bayesian networks, probabilistic inference, and sample applications.

Module 4:
Decision-Making: basics of utility theory, decision theory, sequential decision problems, elementary game theory, sample applications.
Machine Learning and Knowledge Acquisition: learning from memorization, examples, explanation, and exploration. Learning nearest neighbor, naive Bayes, and decision tree classifiers, Q-learning for learning action policies, applications. Sample applications of AI, Student project presentations.

Module 5:
Brief Survey of selected additional topics: perception, communication, interaction, and action; multiagent systems.

References:
1. Artificial Intelligence: A Modern Approach, 3rd Edition, by Stuart Russell and Peter Norvig.

Course Title: **Data Structure and Algorithms**	Course Code: **FDZ680**
Credit: 4	L T P **4 0 0**
Year: 1st	Semester: I/II

Module 1:
Introduction to Data Structures & Algorithms - Arrays and Strings, Algorithm Development, Complexity analysis, Stacks: Operations and Applications, Queues: Operations and Applications, Circular Queues: Operations and Applications, Operation – Creations, insertion, Deletion, Circular Lists, Doubly Linked List

Module 2:
Sorting, Searching, & Graphs - Insertion Sort, Merge Sort, Quick Sort, Binary Search, Selection, Representation: Matrix, Adjacency list, Traversal: Depth First Search, Breadth First Search, Minimum Spanning Tree, Shortest Path

Module 3:
Binary Trees, Heap Sort, Search Trees, Tables, Sets – Representation, Operations: Insert, Delete, Traversal: Preorder, Inorder, Postorder, Method and Complexity, Priority Queue, AVI-trees, B-tree, External Search, Hashing Techniques, Representation, Operations: Union and Find.

Module 4:
Algorithms - Spanning trees: Prim's and Kruskal's algorithm, union-find datastructure, Dijkstra's algorithm for shortest path. shortest path tree. Shortest and longest paths in directed acyclic graphs, All pairs Shortest Path, Transitive Closer, Pattern Matching, Text Editor

Module 5:
Program Development, Testing and Verification - Program Specification, Pre and post Condition, Program Documentations, Testing Methods, Verification Procedures

Reference Books:
1. Thomas H Cormen, Introduction to Algorithms, MIT Press

Course Title: **VLSI Design and Test Flow**	Course Code: **FDZ690**
Credit: 4	L: **4** T: **0** P: **0**
Year: 1st	Semester: I/II

Module 1:
Introduction to Digital VLSI Design Flow Specification, High level Synthesis, RTL Design, Logic Optimization, Verification and Test Planning, Design Representation, Hardware Specific Transformations, **Scheduling, Allocation and Binding:** Problem Specification: Scheduling, Allocation and Binding, Basic Scheduling Algorithms (Time constrained and Resource Constrained), Allocation Steps: Unit Selection, Functional Unit Binding, Storage Binding, Interconnect Binding, Allocation Techniques: Clique Partitioning, Left-Edge Algorithm, Iterative Refinement

Module 2:
Logic Optimization and Synthesis: Heuristic Minimization of Two-Level Circuits: Espresso, Finite State Machine Synthesis, Multi-Level Logic Synthesis, Multi-Level Minimization, Technology Mapping.

Module 3:
DFT: Binary Decision Diagram: Introduction and construction, Reduction rules and Algorithms, ROBDDs, Operation on BDDs and its Algorithms, Representation of Sequential Circuits; **Temporal Logic:** Introduction and Basic Operators, Syntax and Semantics of LTL, CTL and CLT*, Equivalence and Expressive Power. **Model Checking:** Introduction to Verification, Specification and Modelling, Model Checking Algorithm, Symbolic Model Checking, Automata and its use in Verification, Automata Theoretic Model Checking.

Module 4:
Introduction to Digital Testing: Introduction, Test process and Test economics, Functional vs. Structural Testing Defects, Errors, Faults and Fault Modeling (mainly stuck at fault modeling), Fault Equivalence, Fault Dominance, Fault Collapsing and Checkpoint Theorem.

Module 5:
Fault Simulation and Testability Measures: Circuit Modeling and Algorithms for Fault Simulation Serial Fault Simulation, Parallel Fault Simulation, Deductive Fault Simulation, Concurrent Fault Simulation, Combinational SCOAP Measures and Sequential SCOAP Measures, **Combinational Circuit Test Pattern Generation:** Introduction to Automatic Test Pattern Generation (ATPG) and ATPG Algebras, Standard ATPG Algorithm: D-Calculus and D-Algorithm, Basics of PODEM and FAN, **Sequential Circuit Testing and Scan Chains:** ATPG for Single-Clock Synchronous Circuits, Scan Chain based Sequential Circuit Testing

Text Books:
1. Modern VLSI Design: System-on-Chip Design, 3rd Edition: Wayne Wolf, Prentice Hall PTR
2. Essentials of Electronic Testing for Digital, Memory and Mixed Signal VLSI Circuits M.L. Bushnell and V.D. Agrawal, Kluwer Academic Press, 2000, ISBN: 0-7923-7991-8.

Course Title: **System on Chip (SoC) design and test**	Course Code: **FDZ6A0**		
Credit: 4	L	T	P
	4	**0**	**0**
Year: 1st	Semester: I/II		

Module 1:
System on Chip (SoC) design and test,Design and Technology trend: Introduction to design trends in deep submicron (DSM) era, including scaling trend, clock cycle and power issue.

Module 2:
Role of interconnects in contemporary SoC Design: Characteristics of wire delay in DSM, Delay in long wires and performance limitations, Interconnect coupling capacitance and its effect on wire delay, Crosstalk avoidance coding schemes (CAC), Fault Modelling in presence of crosstalk, Interconnect Inductance

Module 3:
System on chip and Platform-based design: IP-based design and reusability, Multiprocessor SoC Platform Design, Design for Testability (DFT), Test Access Mechanism (TAM), Concept of core-based test & IEEE P1500 standard for SoC test

Module 4:
Importance of Power and Low power SoC design methodology: Low-power design methodologies: Physics of Power Dissipation in CMOS, Design and Test of low-voltage CMOS circuits.

Module 5:
Multiple Threshold CMOS (MTCMOS), Variable Threshold CMOS and other related methodologies for leakage power reduction, Coding for low power, Power minimization through architecture level optimization.

Text Books:
1. Analysis and Design of Digital Integrated Circuits - In Deep Submicron Technology, Hodges, Jackson and Saleh, McGraw-Hill, Third Edition, 2004.
2. Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits by M. L. Bushnell and V. D. Agrawal, Boston: Springer, 2005.

Course Title: **Digital Circuit Design**	Course Code: **FDZ6B0**
Credit: 4	L T P **4 0 0**
Year: 1st	Semester: I/II

Module 1: MOS scaling, Short channel effects, MOSFETmodels, Nano CMOS, Effects of gate oxide tunneling, high-k dielectrics, Advanced CMOS structures, SOI, MOSFET capacitances, MOSFET models for calculation- Transistors and Layout, CMOS layout elements, SPICE simulation of MOSFET I-V characteristics and parameter extraction.

Module 2: CMOS inverter, static characteristics, noise margin, dynamic characteristics, inverter design for a given VTC and speed, effect of input rise time and fall time, power dissipation, energy & power delay product, sizing chain of inverters, latch up effect-Simulation of static and dynamic characteristics, layout

Module 3: Combinational and sequential MOS logicdesign, static properties, propagation delay, Elmore delay model, power consumption, low power design techniques, rationed logic, pseudo NMOS inverter, DCVSL, PTL, DPTL & Transmission gate logic, dynamic CMOS design, speed and power considerations, Domino logic and its derivatives, C2MOS, TSPC registers, NORA CMOS.

Module 4: Semiconductor memories, SRAM and DRAM: read & write operation, designing constraints, designing of row & column decoder, designing of sense amplifier; DDR.

Module 5: BiCMOS logic - static and dynamic behavior -Delay and power consumption in BiCMOS Logic Designing of combinational circuits using BiCMOS logic

Text Books:

1. Sung-Mo Kang & Yusuf Leblebici, CMOS Digital Integrated Circuits Analysis & Design, MGH, Third Ed., 2003.
2. Jan M. Rabaey, Digital Integrated Circuits - A DesignPerspective, Prentice Hall, Second Edition, 2005.

Reference Books:

1. David A. Hodges, Horace G. Jackson, & Resve A.Saleh, Analysis and Design of Digital Integrated Circuits, Third Edition, McGraw-Hill, 2004.

Course Title: **Design for Testability–1**	Course Code: **FDZ6C0**
Credit: 4	L T P **4 0 0**
Year: 1st	Semester: I/II

Module 1:
Introduction: The need of testing, the problems of digital and analog testing, Design for test, Software testing.
Faults in Digital Circuits: General introduction, Controllability & Observability, Fault Modeling-Logic, RTL and Structure level models, Compiled Simulation, Event-Driven Simulation, Delay Models, Element Evaluation, Hazard Detection, Gate-level Event-Driven Simulation, Simulation Engines. Fault Models-Stuck-at faults, Bridging faults, and intermittent faults.

Module 2:
Digital Test Pattern Generation: Test pattern generation for combinational logic circuits, Manual test pattern generation, Automatic test pattern generation- Roth's D-algorithm, Developments following Roth's D-algorithm, Pseudorandom test pattern generation, Test pattern generation for sequential circuits, Exhaustive, non-exhaustive and pseudorandom 70 test pattern generation, Delay fault modeling.

Module 3:
Signatures and Self Test: Input compression Output compression Arithmetic, Reed-Muller and Spectral coefficients, Arithmetic and Reed-Muller coefficients, Spectral coefficient, Coefficient test signature, Signature analysis and online self test.

Module 4:
Testability Techniques: Functional testing- Basic Issue, Exhaustive, pseudo exhaustive testing, Partitioning andAd-hocmethods, Scan path testing. Testability- Ad Hoc design for testability, Board level and system level DFT approach, some advance scan concept, BIST: Memory BIST, Logic BIST, Hardware Description Language and Test.

Module 5:
Testing of Analog and Digital Circuits: Testing techniques for filters, A/D converters, RAM, Programmable Logic Devices and DSP

Text Books:
1. VLSI Testing: Digital and Mixed Analogue Digital Technique, Stanley H Hurst , Pub. Inspec/IEE 1999
2. M L Bushnell, B D Agrawal, "Essentials of Electronic Testing for Digital, Memory and Mixed Signal VLSI Circuits", Springer, 2005

Reference Books:
1. Digital System Testing and Testable Design, MironAbramovic et.al. Computer Society Press(1991)
2. Test generation for VLSI Chips, V D Agrawal & S C Seth, IEEE Computer Society Press (2003)

Course Title: **Nanotechnology and its Applications**	Course Code: **FDZ6E0**		
Credit: 4	L	T	P
	4	**0**	**0**
Year: 1st	Semester: I/II		

Module 1:
Introduction to nanotechnology and the two approaches (bottom up and top down) followed for the synthesis of nanomaterials.

Module 2:
Synthetic methodologies: Sol-gel, Micromulsion, CVD,PVD,Molecular beam epitaxy, Vapor (solution)-liquid-solid growth, (VLS or SLS), Spary Pyrolysis, Template based synthesis, Lithography.

Module 3:
Types of Nanostructures: Carbon fullerenes and CNT, Metal and metal oxide nanowires, Self assembly of nanostructures, Core-shell nanostructures, Nanocomposites.

Module 4:
Physical Properties of nanomaterials: Photocatalytic, Dielectric, Magnetic, Optical, and Mechanical

Module 5:
Application of Nanotechnology: Bio-Sensors, Gas Sensors, Photovoltaic, Data Storage, Displays

Reference Books:
1. Guozhong Cao, Nanostructures & Nanomaterials: Synthesis, Properties & Applications, Imperial College Press, 2004

Course Title: **Characterization Tools for Materials**	Course Code: **FDZ6F0**
Credit: 4	L T P **4 0 0**
Year: 1st	Semester: I/II

Module 1:
Overview of Nanostructures and Nanomaterials: classification, Crystalline nanomaterials and defects therein. Hybrid nanomaterials, Multiscale hierarchical structures built out of nanosized building blocks (nano to macro).Nanomaterials in Nature: Nacre, Gecko,Teeth.

Module 2:
Nanostructures: Carbon Nanotubes, Fullerenes, Nanowires, Quantum Dots. Applications of nanostructures. Reinforcement in Ceramics, Drug delivery, Giant magnetoresistance etc. Cells response to Nanostructures. Surfaces and interfaces in nanostructures. Ceramic interfaces, Superhydrophobic surfaces, Grain boundaries in Nanocrystalline materials, Defects associated with interfaces.

Module 3:
Thermodynamics of Nanomaterials. Optical Thin Film Measurements, Ellipsometry, Profilometry, Resistively/Conductivity Measurements.Breakdown Measurements, Junction Testing, Capacitance-Voltage & Current Voltage Measurements.

Module 4:
Overview of properties of nanostructures and nanomaterials. How the performance of nanomaterials come about: sizestructure-Mechanism-property-performance pathway. Overview of characterization of nanostructures and nanomaterials.

Module 5:
Focus on: Brunauer-Emmett-Teller (BET) technique, Transmission Electron Microscopic techniques, Auger Electron Spectroscopy, X-ray Photoelectron Spectroscopy. Electron Energy Loss Spectroscopy. Deformation behaviour of nanomaterials. Fracture and creep. Nanomechanics and nanotribology. Electrical, Magnetic and Optical properties

Reference Books:
1. Nanomaterials, Nanotechnologies and Design: an Introduction to Engineers and Architects, D. Michael Ashby, Paulo Ferreira, Daniel L. Schodek, Butterworth-Heinemann, 2009.
2. Handbook of Nanophase and Nanostructured Materials (in four volumes), Eds: Z.L. Wang, Y. Liu, Z. Zhang, Kluwer Academic/Plenum Publishers, 2003.
3. Handbook of Nanoceramics and their Based Nanodevices (Vol. 2) Edited by Tseung-Yuen Tseng and Hari Singh Nalwa, American Scientific Publishers.

Course Title: **Seminar**	Course Code: FDZ110
Credit: 1	L T P **2 0 0**
Year: 1st	Semester: I/II

Department of Electrical Engineering
DIT University Dehradun

Course Structure & Syllabus
for
Pre Ph.D. (EE) Course Work
Session: 2016-17

Pre Ph.D (EE)

Sr. No.	Course Code	Course Title	L	T	P	Credit
1	GBG010	Research Methodology	4	0	0	4
2		Elective 1	4	0	0	4
3		Elective 2	4	0	0	4
4		Elective 3	4	0	0	4
5	ECZ110	Seminar	0	0	2	1
		Total Credits				**17**

List of Elective

S.No.	Subject Code	Course
1	EBA010	Analysis of Machines
2	EBA020	Electric Drives
3	EBA030	Digital Signal Processing
4	EBB020	Advanced Control System
5	EBB030	Advanced Computational Techniques
6	EBB610	Power Quality
7	EBB620	Power Electronics for Renewable Energy Systems
8	EBB630	Energy Management & Audit
9	EBB640	Distributed Generation
10	EBB650	Instrumentation in Power Electronics System
11	EBB660	FACTS Devices
12	EBB670	Digital Simulation of Power Electronic System
13	EBB680	Special Electric Machines
14	EBB690	High Voltage Direct Current Transmission
15	EBB6A0	Switched Mode Power Converter

Note : Apart from above listed Elective courses, Research Scholar may choose any course across departments being offered at PG level, if it is required/suggested by the Research Committee.

Course Title: **Research Methodology**	Course Code: **GBG010**
Credit: 4	L **4** T **0** P **0**
Year: **2nd**	Semester: I/II

UNIT – I

Fundamentals of Research: Defining research, Objectives of research, types, research process, deductive and inductive reasoning;

Identifying and formulating a research problem, Literature review: Search for existing literature (World Wide Web, Online data bases), Review the literature selected (Case studies, review articles and Meta-analysis), Develop a theoretical and conceptual framework, Writing up the review,

Definition of variables: Concepts, indicators and variables, Types of variables, Types of measurement scales, Constructing the Hypothesis- Null(Research) and alternative, one-tailed and two-tailed testing, errors in testing. Ethical and Moral Issues in Research, Plagiarism, tools to avoid plagiarism – Intellectual Property Rights – Copy right laws – Patent rights

UNIT – II

Research Design: Design of Experiments: Research Designs -Exploratory, Descriptive and Experimental, Experimental designs- Types of Experimental Designs

UNIT – III

Sampling, Sampling distribution, and Data Collection: Sampling distribution, Normal and binomial distribution, Reasons for sampling, sampling technique, sampling errors.Sources of Data-Primary Data, Secondary Data, Data Collection methods

UNIT – IV

Statistical Data Analysis: Descriptive and inferential statistical analysis. Testing of hypothesis with Z-test, T-test and its variants, Chi-square test, ANOVA, Correlation, Regression Analysis, Introduction to data analysis data using SPSS20.0

UNIT – V

Research Report: Writing a research report- Developing an outline, Formats of Report writing, Key elements-Objective, Introduction, Design or Rationale of work, Experimental Methods, Procedures, Measurements, Results, Discussion, Conclusion, Referencing and various formats for reference writing of books and research papers, Writing a Research Proposal.

Books Recommended:

1. Ganesan R, Research Methodology for Engineers , MJP Publishers, Chennai. 2011
2. C.R.Kothari, "Research Methodology", 5th edition, New Age Publication,
3. Cooper, "Business Research Methods", 9th edition, Tata McGraw hills publication
4. Walpole R.A., Myers R.H., Myers S.L. and Ye, King: Probability & Statistics for Engineers and Scientists, Pearson Prentice Hall, Pearson Education, Inc. 2007.
5. Anderson B.H., Dursaton, and Poole M.: Thesis and assignment writing, Wiley Eastern 1997.
6. Bordens K.S. and Abbott, B.b.: Research Design and Methods, McGraw Hill, 2008.
7. Morris R Cohen: An Introduction to logic and Scientific Method (Allied Publishers) – P 197-222; 391–403

Course Title: **Analysis of Machines**	Course Code: **EBA010**
Credit: 4	L **4** T **0** P **0**
Year: **1st**	Semester: I/II

INTRODUCTION – Unified approach to the analysis of electrical machine – basic two-pole machine – Kron's primitive machine – voltage, power and torque equation –linear transformation from 3-phase to 2-phase - transformation from rotating axes to stationary axes – power invariance – park's transformation for 3-phase synchronous and induction machines.

INDUCTION MACHINES – 3-phase induction machine- generalized model – voltage equation – electric transients in induction machines – applications in speed control of induction machine – induction motor modeling in arbitrary reference frame and in field oriented frame

POLYPHASE SYNCHRONOUS MACHINES – generalized machine equations – steady state analysis of salient pole and non salient pole machines – phasor diagrams – power angle characteristics – reactive power – short circuit ratio – transient analysis – sudden 3-phase short circuit at generator terminals – reactance – time constants – transient power angle characteristics**.**

REFERENCE BOOKS

1. PS. Bhimbra, *Generalized Theory of Electrical Machines*, Khanna Publishers
2. Krauss, Wasyncsuk and Sudholf, *Analysis of Electrical Machines and Drive Systems*, John Wiley
3. A E Fitzgerald, Kingsley, Umans, *Electric Machinery*, McGraw Hill
4. Bimal K Bose, *Modern Power Electronics & AC Drives*, Pearson Education

Course Title: **Electric Drives**	Course Code: **EBA020**
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: I/II

COMPONENTS OF ELECTRICAL DRIVES – electric machines, power converter, controllers - dynamics of electric drive - torque equation - equivalent values of drive parameters- components of load torques types of load - four quadrant operation of a motor — steady state stability - load equalization – classes of motor duty- determination of motor rating.

DC MOTOR DRIVES – dc motors & their performance (shunt, series, compound, permanent magnet motor, universal motor, dc servomotor) – braking – regenerative, dynamic braking, plugging – Transient analysis of separately excited motor – converter control of dc motors – analysis of separately excited & series motor with 1-phase and 3-phase converters – dual converter – analysis of chopper controlled dc drives – converter ratings and closed loop control - transfer function of self, separately excited DC motors – linear transfer function model of power converters – sensing and feeds back elements – current and speed loops.

INDUCTION MOTOR DRIVES – stator voltage control of induction motor – torque-slip characteristics –operation with different types of loads – operation with unbalanced source voltages and single phasing – analysis of induction motor fed from non-sinusoidal voltage supply – stator frequency control – variable frequency operation – V/F control, controlled current and controlled slip operation – effect of harmonics and control of harmonics – PWM inverter drives – multi-quadrant drives – rotor resistance control – slip torque characteristic – torque equations, constant torque operation – slip power recovery scheme – torque equation – torque slip characteristics – power factor – methods of improving power factor – limited sub synchronous speed operation – super synchronous speed operation, introduction to vector control.

SYNCHRONOUS MOTOR DRIVES – speed control of synchronous motors – adjustable frequency operation of synchronous motors – principles of synchronous motor control – voltage source inverter drive with open loop control – self-controlled synchronous motor with electronic commutation – self-controlled synchronous motor drive using load commutated thyristor inverter.

REFERENCE BOOKS

1. R. Krishnan, *Electical Motor Drives*, PHI
2 GK Dubey, *Fundamentals of Electrical Drives*, Narosa
3. GK Dubey, *Power Semi-conductor Controlled Drives*, Prentice Hall
4. Bimal K Bose, *Modern Power Electronics & AC Drives*, PHI
5. S A Nasar, Boldea, *Electrical Drives*, CRC press
6. M A Elsharkawi, *Fundamentals of Electrical Drives*, Thomson Learning
7. W Leohnard, *Control of Electric Drives*, Springer
8. Murphy and Turnbill, *Power Electronic Control of AC motors*, Pergamon Press
9. Vedam Subarhmanian, *Electric Drives*, TMH

Course Title: **Digital Signal Processing**	Course Code: **EBA030**		
Credit: 4	L	T	P
	4	**0**	**0**
Year: **1st**	Semester: I/II		

MATLAB FOR SIGNAL PROCESSING - Introduction, What Is MATLAB? Testing and Looping, Functions and Variables, Plotting and Graphing, Loading and Saving Data, Multidimensional Arrays, Bitwise Operators, Vectorizing Code, Using MATLAB for Processing Signals.

SAMPLED SIGNALS AND DIGITAL PROCESSING - Processing Signals Using Computer Algorithms, Digital Representation of Numbers, Sampling, Quantization, Image Display, Aliasing, Reconstruction, Block Diagrams and Difference Equations Linearity, Superposition, and Time Invariance, Practical Issues and Computational Efficiency.

RANDOM SIGNALS - Random and Deterministic Signals, Random Number Generation, Statistical Parameters, Probability Functions, Common Distributions, Continuous and Discrete Variables, Signal Characterization, Histogram Operators, Median Filters. REPRESENTING SIGNALS AND SYSTEMS: Discrete-Time Waveform Generation, The z Transform, Polynomial Approach, Poles, Zeros, and Stability, Transfer Functions and Frequency Response, Vector Interpretation of Frequency Response, Convolution.

TEMPORAL AND SPATIAL SIGNAL PROCESSING - Correlation, Linear Prediction, Noise Estimation and Optimal Filtering, Tomography. FREQUENCY ANALYSIS OF SIGNALS: Fourier series, Phase-Shifted Waveforms, The Fourier Transform, Aliasing in Discrete-Time Sampling, Time-Frequency Distributions, Buffering and Windowing, FFT, DCT.

DISCRETE-TIME FILTERS - Filter Specification, Design and Implementation, Filter Responses, Non-recursive Filter Design, Ideal Reconstruction Filter, Filters with Linear Phase, Fast Algorithms for Filtering, Convolution and Correlation, Recursive filters.

REFERENCE BOOKS

1. John W.Leis: Digital Signal Processing Using MATLAB for Students and Researchers, John Wiley & Sons.
2. Proakis J G and D G Manolakis: Digital Signal Processing: Principles, Algorithms, and Applications, Englewood Cliffs, NJ: Prentice Hall.
3. Kumar B P: Digital Signal Processing Laboratory, Oxford: Taylor and Francis.
4. Hamming R W: Digital Filters, Englewood Cliffs, NJ: Prentice Hall.
5. Jain A K: Fundamentals of Digital Image Processing, Englewood Cliffs, NJ: Prentice Hall.

Course Title: **Advanced Control System**	Course Code: **EBB020**
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: I/II**I**

REVIEW OF MODELING AND ANALYSIS OF LTI SYSTEMS:

Modeling of physical Systems. Design specifications and performance indices, Motion control systems, Transportation lags. Approximation of time-delay functions, Sensitivity of control systems to parameter variations. Effects of disturbance of signals. Disturbance rejection.

ANALYSIS IN STATE-SPACE:

A perspective on state-space design, State variables, State models for physical systems, SISO and MIMO systems, Solution of state equations. Transfer function, Eigenvalues and eigenvectors, Jacobian linearization technique, State transformations and diagonalisation, Transformation to phase-variable canonical form, Controllability and observability, Duality property, Stability.

INTRODUCTION TO DISCRETE-TIME SYSTEMS:

Basic elements of discrete-time control system, Z-transform and properties, Inverse Z-transform, Difference equation and its solution by Z-transform method, Z-transfer function, State diagram of digital systems, Time delay, Direct, cascade and parallel decomposition of Z-transfer functions.

FEEDBACK CONTROL DESIGN:

Continuous control design, Proportional, derivative and integral control action, PID controller tuning rules, Ziegler-Nichols method, Two degree of freedom control systems, Compensator design using Bode diagram in frequency response approach, Lag, Lead, Lag-lead compensator, Control law design for full state feedback by pole placement, Full order observer system, Observer based state feedback, Separation principal.

NON LINEAR SYSTEM:

Classification and types of non-linearity, Phenomena peculiar to non-linear systems, Methods of analysis, Linearization based on Taylor's series expansion, Jacobian Linearization, Phase trajectory and its construction, Phase-plane analysis of linear and non-linear systems, Existence of limit cycles, Describing function of typical non-linearities, Stability analysis by DF method, Introduction to DIDF, Popov's circle criterion, Stability analysis by Lyapunov's indirect and direct methods, Lypunov's theorem.

REFERENCE BOOKS:

1. Ogata, K – Modern Control Engineering, PHI Learning
2. Kuo, B.C. – Automation Control Systems, Prentice Hall
3. Roy Choudhury, D – Modern Control Engineering, Prentice Hall
4. Nagrath, J. J. Gopal, M – Control System Engineering, New Age Pub.
5. Schulz, D.G. and Melsa, . L. – State Functions and Linear Control Systems, McGraw-Hill.
6. Stepheni, Shahian, Savant, Hostetler – Design of feedback control systems, Oxford University Press.
7. Vidyasagar- Nonlinear system analysis, Prentice-Hall.
8. Gibson, J.E.- Non linear system , Mc. Grawhill.
9. Gopal. M, Digital Control and State Variable Methods, TMH

Course Title: **Advanced Computational Techniques**	Course Code: **EBB030**
Credit: 4	L **4** T **0** P **0**
Year: **1st**	Semester: I/II**I**

Artificial Neural Networks-I Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron and convergence theorem, Adaline and Madaline, Feed-forward Multilayer Perceptron. Learning and Training the neural network.

Artificial Neural Networks-II Back propagation-RBF algorithms-Hope field networks, Introduction to Kohanan's Self organization map, architecture and algorithms and recurrent network.

Fuzzy logic Systems - Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate
Reasoning, Fuzzification, Membership value assignment, inference and defuzzification. Fuzzy knowledge and rule bases. Self-organizing fuzzy logic control.

Genetic Algorithm - Basic concept of Genetic algorithm Mutation, Reproduction and crossover and detail algorithmic steps. engineering applications.

APPLICATIONS Fuzzy Logic: Design of Fuzzy PI controller for speed control of DC motor using Matlab fuzzy-logic toolbox. Inverted pendulum Neuro controller, **GA** with examples

TEXT BOOKS

1. Neural Networks: A comprehensive Foundation – Simon Haykins, Pearson Edition, 2003.
2. Fuzzy logic with Fuzzy Applications – T.J.Ross – Mc Graw Hill Inc, 1997.
3. Genetic Algorithms- David E Goldberg.
4. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHI Publication.
5. Introduction to Artificial Neural Systems - Jacek M. Zuarda, Jaico Publishing House, 1997.

Course Title: **Power Quality** ***(Elective)***	Course Code: **EBB610**
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: I/II**I**

INTRODUCTION: Characterization of Electric Power Quality: Transients, short duration and long duration voltage variations, Voltage imbalance, waveform distortion, Voltage fluctuations, Power frequency variation, Power acceptability curves – power quality problems: poor load power factor, Nonlinear and unbalanced loads, DC offset in loads, Notching in load voltage, Disturbance in supply voltage – Power quality standards.

NON-LINEAR LOADS Single phase static and rotating AC/DC converters, Three phase static AC/DC converters, Battery chargers, Arc furnaces, Fluorescent lighting, pulse modulated devices, Adjustable speed drives.

MEASUREMENT AND ANALYSIS METHODS Voltage, Current, Power and Energy measurements, power factor measurements and definitions, event recorders, Measurement Error – Analysis: Analysis in the periodic steady state, Time domain methods, Frequency domain methods: Laplace's, Fourier and Hartley transform – The Walsh Transform – Wavelet Transform.

ANALYSIS AND CONVENTIONAL MITIGATION METHODS Analysis of power outages, Analysis of unbalance: Symmetrical components of phasor quantities, Instantaneous symmetrical components, Instantaneous real and reactive powers, Analysis of distortion: On–line extraction of fundamental sequence components from measured samples – Harmonic indices – Analysis of voltage sag: Detorit Edison sag score, Voltage sag energy, Voltage Sag Lost Energy Index (VSLEI)- Analysis of voltage flicker, Reduced duration and customer impact of outages, Classical load balancing problem: Open loop balancing, Closed loop balancing, current balancing, Harmonic reduction, Voltage sag reduction.

POWER QUALITY IMPROVEMENT Utility-Customer interface –Harmonic filters: passive, Active and hybrid filters – Custom power devices: Network reconfiguring Devices, Load compensation using DSTATCOM, Voltage regulation using DSTATCOM, protecting sensitive loads using DVR, UPQC – control strategies: P-Q theory, Synchronous detection method – Custom power park – Status of application of custom power devices.

REFERENCE BOOKS

1. Arindam Ghosh "Power Quality Enhancement Using Custom Power Devices", Kluwer Academic Publishers, 2002
2. G.T.Heydt, "Electric Power Quality", Stars in a Circle Publications, 1994(2nd edition)
3. Power Quality - R.C. Duggan
4. Power system harmonics –A.J. Arrillga
5. Power electronic converter harmonics –Derek A. Paice

Course Title: **Power Electronics for Renewable Energy Systems** *(Elective)*	Course Code: **EBB620**
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: I/II**I**

INTRODUCTION
Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment (cost-GHG Emission) - Qualitative study of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems.

ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION
Review of reference theory fundamentals-principle of operation and analysis: IG, PMSG, SCIG and DFIG.

POWER CONVERTERS Solar: Block diagram of solar photo voltaic system -Principle of operation: line commutated converters (inversion-mode) - Boost and buck-boost converters- selection of inverter, battery sizing, array sizing
Wind: three phase AC voltage controllers- AC-DC-AC converters: uncontrolled rectifiers, PWM Inverters, Grid Interactive Inverters-matrix converters.

ANALYSIS OF WIND AND PV SYSTEMS
Stand alone operation of fixed and variable speed wind energy conversion systems and solar system-Grid connection Issues -Grid integrated PMSG and SCIG Based WECS Grid Integrated solar system

HYBRID RENEWABLE ENERGY SYSTEMS
Need for Hybrid Systems- Range and type of Hybrid systems- Case studies of Wind-PV Maximum Power Point Tracking (MPPT).

REFERENCE BOOKS
1. Rashid .M. H "power electronics Hand book", Academic press, 2001.
2. Rai. G.D, "Non-conventional energy sources", Khanna publishes, 1993.
3. Rai. G.D," Solar energy utilization", Khanna publishes, 1993.
4. Gray, L. Johnson, "Wind energy system", prentice hall linc, 1995.
5. Non-conventional Energy sources B.H.Khan Tata McGraw-hill Publishing Company, New Delhi.

Course Title: **Energy Management & Audit *(Elective)***	Course Code: **EBB630**
Credit: 4	L **4** T **0** P **0**
Year: **1st**	Semester: I/II**I**

ENERGY SCENARIO: Energy sources, security, conservation, strategy, Basics of Energy and its various forms, Regulatory mechanism in power system, Electricity safety rules and regulations.
ENERGY MANAGEMENT & AUDIT: Energy costs, Bench marking, efficiency, audit instruments, Energy Action Planning: Role, motivation, training, information systems.
ENERGY MONITOR OF ELECTRICAL SYSTEM: Power supply, Electricity billing, Electrical load management and maximum demand control, Power factor improvement and its benefit, Selection and location of capacitors, Performance assessment of PF capacitors, Distribution and transformer losses.
ENERGY EFFICIENT MOTORS: losses, efficiency, selection, energy efficient motors, Factors affecting motor performance, Rewinding and motor replacement issues. Energy saving opportunities with Pumps, cooling towers, fans and blower.
LIGHTING SYSTEM: Light source, Choice of lighting, Luminance requirements, and Energy conservation avenues.
ENERGY EFFICIENT TECHNOLOGIES IN ELECTRICAL SYSTEMS: Maximum demand controllers, Automatic power factor controllers, Energy efficient motors, Soft starters with energy saver, Variable speed drives, Energy efficient transformers, Electronic ballast, Occupancy sensors, Energy efficient lighting controls.

REFERENCE BOOKS

1. Albert : Plant Engineers & Managers Guide to Energy Conservation
2. Wayhe C.Tuner : Energy Management Handbook
3. Anthony J. Pansini. : Engineering Economic Analysis Guide Boo
4. D. Paul-Mehta : Handbook of Energy Engineering.
5. Paul O'Callaghan : Energy Management.
6. Books of Energy Management & Auditors, Bureau of Energy Efficiency, (A Statutory body under Ministry of Power, Government of India), www.bee-india.nic.in9 volume I,II,III & IV

Course Title: **Distributed Generation** *(Elective)*	Course Code: **EBB640**
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: I/II

PHOTO-VOLTAIC, FUEL CELLS AND MHD: Basic characteristics of sunlight- solar energy resource- photovoltaic cell – cell efficiency characteristics - equivalent circuit- photo voltaic for battery charging- charge regulators- PV modules- battery backup limitations - equipments and systems- types of fuel cells -losses in fuel cells- MHD generators- application of MHD generation.

WIND TURBINES AND EMBEDDED GENERATION: Wind Source-wind statistics- energy in the wind- aerodynamics- rotor types – forces developed by blades- aerodynamic models- braking systems-tower- control and monitoring system- power performance- Wind driven induction generators-power circle diagram-steady state performance-modelling-integration issues-impact on central generation-transmission and distribution systems-wind farm electrical design.

ISOLATED GENERATION: Wind -diesel systems-fuel savings- permanent magnet alternators-modelling-steady state equivalent circuit- self excited induction generators – integrated wind -solar systems.

OTHER RENEWABLE SOURCES AND BIO FUELS: Micro- hydel electric systems-power potential -scheme layout-generation efficiency and turbine part flow isolated and parallel operation of generators-geothermal-tidal and OTEC systems-classification of bio fuels- Conversion process- applications.

REFERENCE BOOKS

1. John F.Walker & Jenkins N., `Wind Energy Technology', John Wiley and sons, Chichester, U.K., 1997.
2. Van Overstraeton R. J and Mertens R P., ` Physics, Technology and use of Photovoltaics', Adem Hilger, Bristol, 1996.
3. Sukhatme,S.P.,`Solar Energy- Principles of Thermal Collection and Storage' Tata Mc-Graw-Hill, New Delhi.
4. S.L.Soo, 'Direct Energy Conversion', Prentice Hall Publication.
5. Freries L.L., 'Wind Energy Conversion Systems', Prentice Hall U .K., 1990.
6. Kreith,F., and Kreider,J.F., 'Principles of Solar engineering', Mc-Graw-Hill, Book Co.
7. Imamura M. S.et.al., 'Photo voltaic System Technology, European Hand Book', H S., Stephen and Associate, 1992.
8. James Larminie, Andrew Dicks,Fuel Cell Systems', John Wiley and Sons Ltd
9. Chapman and E.J.Womack, 'MHD Power Generation Engineering Aspects', Hall Publication.
10. H. Lee Willis, and W. G. Scott, ‘Distributed Power Generation’, Marcel Dekker, Inc. 2000.

Course Title: **Instrumentation in Power Electronics System** *(Elective)*	Course Code: **EBB650**
Credit: 4	L **4** T **0** P **0**
Year: **1st**	Semester: I/II**I**

TRANSDUCER INSTRUMENTATION: Primary sensors, voltage and current generating analogue Transducers, variable parameter analogue Transducers, Frequency generating and Digital Transducers, transducer selection factors.

TELEMETRY SYSTEM: Introduction to Information Transmission. Basic ideas.
Transducer and Sensors: Definitions , classification of errors,

DEVICES FOR INSTRUMENTATION Amplifiers, Multiplexes, Timers, Sample and Hold, Isolators, Signal Converters, ADC & DAC , Instrumentation & Signal Processing, drive related signals and their instrumentation and conditioning,

DATA ACQUISITION SYSTEM basic structure, data acquisition of drive related variables.

REFERENCE BOOKS:

1. Cooper Helfrick, “Electrical Instrumentation and Measuring Techniques”, Prentice Hall India, 1986
2. D. C. Nakra and K. K. Chowdhry, “Instrumentation, Measurement, and Analysis”, Tata McGraw Hill Publishing Co., 1984

Course Title: **FACTS Devices** ***(Elective)***	Course Code: **EBB660**
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: I/II**I**

FACTS AND PRELIMINARIES: FACTS concept and general system considerations - power flow in AC system - definitions on FACTS - basic types of FACTS controllers. Converters for Static Compensation - Three phase converters and standard modulation strategies (Programmed Harmonic Elimination and SPWM) - GTO Inverters - Multi-Pulse Converters and Interface Magnetics - Transformer Connections for 12, 24 and 48 pulse operation - Multi-Level Inverters of Diode Clamped Type and Flying Capacitor Type and suitable modulation strategies (includes SVM) - Multi-level inverters of Cascade Type and their modulation - Current Control of Inverters.

STATIC SHUNT AND SERIES COMPENSATORS: Static Shunt Compensators - SVC and STATCOM - operation and control of TSC, TCR, STATCOM - Compensator Control - Comparison between SVC and STATCOM - STATCOM for transient and dynamic stability enhancement. Static Series Compensation - GCSC, TSSC, TCSC and SSSC - operation and control – external system control for series compensators - SSR and its damping - static voltage and phase angle regulators - TCVR and TCPAR - operation and control

UPFC AND IPFC: The Unified Power Flow Controller - operation, comparison with other FACTS devices - control of P and Q - dynamic performance - Special Purpose FACTS Controllers - Interline Power Flow Controller - operation and control.

POWER QUALITY AND INTRODUCTION TO CUSTOM POWER DEVICES: Power Quality issues related to distribution systems – custom power devices – Distribution STATCOM – Dynamic Voltage restorer – Unified Power Quality Conditioner – Application of D-STATCOM, DVR and UPQC for improving power quality in distribution systems.

REFERENCE BOOKS

1. K. R. Padiyar, *FACTS Controllers in Power Transmission and Distribution*, New Age International
2. N.G. Hingorani & L. Gyugyi, *Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems*, IEEE Press
3. T.J.E Miller, *Reactive Power Control in Electric Systems*, John Wiley & Sons.
4. Ned Mohan et.al, *Power Electronics*, John Wiley and Sons.
5. Dr Ashok S & K S Suresh Kumar "*FACTS Controllers and applications*" course book for STTP, 2003.

Course Title: **Digital Simulation of Power Electronic System** ***(Elective)***	Course Code: **EBB670**
Credit: 4	L **4** T **0** P **0**
Year: **1st**	Semester: I/II**I**

PRINCIPLES OF MODELING POWER SEMICONDUCTOR DEVICES - Macro models versus Micro models - Thyristor model - Semiconductor Device modelled as Resistance, Resistance-Inductance and Inductance-Resistance-Capacitance combination - Modelling of Electrical Machines.

MODELING OF CONTROL CIRCUITS FOR POWER ELECTRONIC SWITCHES. Computer Formulation of Equations for Power Electronic Systems –Review of graph theory as applied to Electric networks- Systematic method of Formulating State Equations - Computer Solution of State Equations – Explicit Integration method - Implicit Integration method. AC equivalent circuit modelling: Basic AC modelling approach-State space averaging-circuit averaging and averaged switch modelling - Modelling the PWM.

ANALYSIS USING SOFTWARE TOOLS Circuit Analysis Software ORCAD- PSpice - Simulation Overview - Creating and Preparing a Circuit for Simulation - Simulating a Circuit with PSpice - Simple Multi-run Analyses - Statistical Analyses - Simulation Examples of Power Electronic systems- Creating Symbols - Creating - Models - Analog Behavioral Modeling - Setting Up and Running analyses – Viewing Results - Examples of Power Electronic Systems.

DYNAMIC MODELLING OF CONVERTERS - Dynamic modelling and simulation of DC-DC converters using MATLAB - Simulation of State Space Models - Modeling and simulation of inverters using MATLAB

REFERENCE BOOKS

1. V Rajagopalan, *Computer Aided Analysis of Power Electronic Systems,* Marcel Dekker,Inc.
2. Erickson, Maksimovic, *Fundamentals of Power Electronics - 2nd edition*, Springer
3. Randall Shaffer, *Fundamentals of Power Electronics with MATLAB*, Firewall Media,India
4. Mohan, Undeland, Robbins, *Power Electronics, 3rd edition,* John Wiley
5. Jai P Agrawal, *Power Electronic Systems-Theory and Design*, Pearson
6. ORCAD PSpice Basics: Circuit Analysis Software, User's Guide, ORCAD Corporation

Course Title: **Special Electric Machines** ***(Elective)***	Course Code: **EBB680**
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: I/II**I**

STEPPER MOTOR: Introduction, Types, Hybrid stepper motor- construction, principle of operation, two phases energized at a time, conditions for operation, different configurations, VR Stepper motor- single stack and multi stack, Drive systems and circuit for open loop and Closed loop control of stepping motor. Dynamic characteristics. Single phase stepper Motor, Expression of voltage, current and torque for stepper motor and criteria for synchronization.

SWITCHED RELUCTANCE MOTOR: Constructional features, principle of operation, Design Aspects and profile of the SRM, Torque equation, Power converters and rotor sensing mechanism, expression of torque and torque-speed characteristics,

PERMANENT MAGNET MATERIALS: Permanent magnet materials, properties, minor hysteresis loop and recoil line, equivalent circuit, stator frames with permanent magnets,

BRUSHLESS DC MOTOR: Construction, operation, sensing and switching logic scheme, Drive and power circuit, Theoretical analysis and performance prediction, transient Analysis.

LINEAR INDUCTION MOTOR: Construction and principle of operation of Linear Induction Motor, Approximate calculation of the force on rotor.

REFERENCE BOOKS

1. Vekatratnam, “Special Electrical Machines”, Universities Press
2. Fitzerald and Kingsley,” Electrical Machines” McGraw Hill.
3. Miller. T. J. E., “Brushless Permanent Magnet and Reluctance Motor Drives”, Clarendon Press, Oxford, 1989.
4. Kenjo. T and Nagamori. S, “Permanent Magnet and Brushless DC Motors”, Clarendon Press, Oxford, 1989.
5. Kenjo. T, “Stepping Motors and their Microprocessor Control”, Clarendon Press, Oxford, 1989

Course Title: **High Voltage Direct Current Transmission** *(Elective)*	Course Code: **EBB690**
Credit: 4	L **4** T **0** P **0**
Year: **1st**	Semester: I/II**I**

INTRODUCTION: Introduction to AC and DC Transmission – application of DC Transmission – description of DC transmission – DC system components and their functions – modern trends in DC Transmission

CONVERTER: Pulse Number – Converter configuration – analysis of Graetz circuit – converter bridge characteristics – characteristics of 12 Pulse converter

HVDC CONTROLLERS: General principle of DC link control – converter control characteristics – system control hierarchy – firing angle control – current and extinction angle control – Dc link power control – high level controllers

FILTERS: Introduction to harmonics – generation of harmonics – design of AC filters – DC filters – carrier frequency and RI noise

PROTECTION: Basics of protection – DC reactors – voltage and current oscillations – circuit breakers – over voltage protection – switching surges – lightning surges – lightning arresters for DC systems

REFERENCE BOOKS

1. Kimbark, "Direct Current Transmission – Vol. I", John Wiley and Sons Inc., New York, 1971
2. Padiyar. K. R., "HVDC Power Transmission Systems", Wiley Eastern Limited, New Delhi, 2000.
3. Arrillaga. J, "High Voltage Direct Current Transmission", Peter Peregrines, London, 1983

Course Title: **Switched Mode Power Converter** ***(Elective)***	Course Code: **EBB6A0**
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: I/II**I**

1. **Reactive Elements in Power Electronic Systems:** Design of inductor, Design of transformer, Capacitors for power electronic applications.

2. **DC-TO-DC Converters:** Buck converter, Boost Converter, Buck-Boost Converter, Forward Converter, Push-Pull Converter, Fly-back Converter, Half and full bridge Converter.

3. **Closed Loop Control of Power Converters:** Design of compensators, closed loop performance functions, Effect of Input Filter on the Converter Performance, Design Criteria for Selection of Input Filter.

4. **Classification of Resonant Converters:** Basic resonant circuit concepts, Load resonant converters, Resonant Switch Converters, Zero Voltage Switching.

5. **Design of Feedback compensators:** Unity power factor rectifiers, Resistor emulation principle and applications to rectifiers.

REFERENCE BOOKS:

1. Switched Mode Power Conversion, Course Notes, CCE, IISc, 2004.
2. Issa Batarseh, "Power Electronic circuits", John Wiley, 2004.
3. Philip T Krein, "Elements of Power Electronics", Oxford Press.

Course Title: **Seminar**	Course Code: **E13B10**
Credit: 4	L T P **0 0 8**
Year: **2nd**	Semester: I/II**I**

Objective:
To assess the debating capability of the student to present a technical topic. Also to impart training to a student to face audience and present his ideas and thus creating in him self-esteem and courage that are essential for an engineer.

Individual students are required to choose a topic of their interest from power electronics and drives related topics preferably from outside the M.Tech syllabus and give a seminar on that topic about 30 minutes. A committee consisting of at least three faculty members (preferably specialized in power electronics) shall assess the presentation of the seminar and award marks to the students. Each student shall submit two copies of a write up of his seminar topic. One copy shall be returned to the student after duly certifying it by the chairman of the assessing committee and the other will be kept in the departmental library. Internal continuous assessment marks are awarded based on the relevance of the topic, presentation skill, quality of the report and participation.

Course Title: **Dissertation Phase-I**	Course Code: **E13C10**
Credit: 12	L T P **0 0 24**
Year: **2nd**	Semester: I/II**I**

Course Title: **Dissertation Phase-II**	Course Code: **E14C10**
Credit: 16	L: **0** T: **0** P: **32**
Year: **2nd**	Semester: I/II**V**

Objective:

To improve the professional competency and research aptitude by touching the areas which otherwise not covered by theory or laboratory classes. The project work aims to develop the work practice in students to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research.

The project work can be a design project/experimental project and/or computer simulation project on any of the topics in power electronics/drives related topics. The project work is allotted individually on different topics. The students shall be encouraged to do their project work in the parent institute itself. If found essential, they may be permitted to continue their project outside the parent institute. Department will constitute an Evaluation Committee to review the project work. The Evaluation committee will consist of at least three faculty members of which internal guide and another expert in the specified area of the project shall be two essential members.

The student is required to undertake the master research project phase 1 during the third semester and the same is continued in the 4thsemester (Phase 2). Phase 1 consist of preliminary thesis work, two reviews of the work and the submission of preliminary report. First review would highlight the topic, objectives, methodology and expected results. Second review evaluates the progress of the work, preliminary report and scope of the work which is to be completed in the 4th semester. The Evaluation committee consists of at least three faculty members of which internal guide and another expert in the specified area of the project shall be two essential members.

Department of Humanities & Social Sciences
DIT University Dehradun

Course Structure & Syllabus
for
Pre Ph.D. (English) Course Work
Session: 2016-17

Pre Ph.D (English)

Sr. No.	Course Code	Course Title	L	T	P	Credit
1	HCZ010	Research Methodology	4	0	0	4
2	HCZ020	Literary Criticism and Literary Theory	4	0	0	4
3		Elective 1	4	0	0	4
4		Elective 2	4	0	0	4
5	HCZ110	Seminar	0	0	2	1
		Total Credits				**17**

List of Electives

S.No.	Subject Code	Course
1	HCZ610	Art of Fiction
2	HCZ620	Literature of Diaspora
3	HCZ630	English Language Teaching

Note : Apart from above listed Elective courses, Research Scholar may choose any course across departments being offered at PG level, if it is required/suggested by the Research Committee.

Pre Ph.D (English)

Course Title: **Research Methodology**	Course Code: HCZ010
Credit: 4	L **4** T **0** P **0**
Year: **1st**	Semester: **I/II**

Unit I **Fundamentals of Research:** Defining research, Objectives of research, types, research process, deductive and inductive reasoning; Identifying and formulating a research problem, Literature review: Search for existing literature (World Wide Web, Online data bases), Review the literature selected (Case studies, review articles and Meta-analysis), Develop a theoretical and conceptual framework, Writing up the review.

Definition of variables : Concepts, indicators and variables, Types of variables, Types of measurement scales, Constructing the Hypothesis- Null(Research) and alternative, one-tailed and two-tailed testing, errors in testing. Ethical and Moral Issues in Research, Plagiarism, tools to avoid plagiarism – Intellectual Property Rights – Copy right laws – Patent rights

Unit II **Research Design:** Design of Experiments: Research Designs -Exploratory, Descriptive and Experimental, Experimental designs- Types of Experimental Designs

Unit III **Sampling, Sampling distribution, and Data Collection:** Sampling distribution, Normal and binomial distribution, Reasons for sampling, sampling technique, sampling errors. Sources of Data-Primary Data, Secondary Data, Data Collection methods.

Unit IV **Statistical Data Analysis:** Introduction to data analysis, Descriptive and inferential statistical analysis. Testing of hypothesis with Z-test, T-test and its variants, Chi-square test, ANOVA, Correlation, and Regression Analysis.

Unit V **Research Report:** Writing a research report- Developing an outline, Formats of Report writing, Key elements-Objective, Introduction, Design or Rationale of work, Experimental Methods, Procedures, Measurements, Results, Discussion, Conclusion, Referencing and various formats for reference writing of books and research papers, Writing a Research Proposal.

References:

1. Ganesan R, Research Methodology for Engineers , MJP Publishers, Chennai. 2011
2. C.R.Kothari, "Research Methodology", 5th edition, New Age Publication,
3. Cooper, "Business Research Methods", 9th edition, Tata McGraw hills publication
4. Walpole R.A., Myers R.H., Myers S.L. and Ye, King: Probability & Statistics for Engineers and Scientists, Pearson Prentice Hall, Pearson Education, Inc. 2007.
5. Anderson B.H., Dursaton, and Poole M.: Thesis and assignment writing, Wiley Eastern 1997.
6. Bordens K.S. and Abbott, B.b.: Research Design and Methods, McGraw Hill, 2008.
7. Morris R Cohen: An Introduction to logic and Scientific Method (Allied Publishers) – P 197 -222; 391 – 403

Pre Ph.D (English)

Course Title: **Literary Criticism and Literary Theory**	Course Code: HCZ020
Credit: 4	L **4** T **0** P **0**
Year: **1st**	Semester: **I/II**

Objectives

1. To make the scholars know and appreciate the finer sensibilities of literature.
2. To equip them with the critical nuance to evaluate various genre for in-depth research.
3. To nourish the philosophical faculty of the scholar.

Unit 1 Conceptual Background (9Hrs.)

1. Appreciation of Literature
2. Literary Sensibility
3. Literature, Life and Society
4. Truth and Morality in Literature

Unit 2 Theories of Literary Appreciation (9Hrs)

1. Art for Art's sake
2. Psychological Appreciation of Literature: Freud and Jung
3. Archetypal Criticism
4. New Criticism and Structuralism
5. Reader-Response Theory

Unit 3 Recent Trends in Literary Appreciation (8Hrs)

1. The Post-War Scenario and Social Changes
2. Feminist Readings of the Texts
3. Post Structuralism
4. Deconstruction
5. Postmodernism
6. Post colonialism

Suggested Books:

1. Theory of Literature, Wellek and Warren, 1999
2. Literary Theory: An Introduction, Terry Eagleton, 1983
3. Contemporary Literary Criticism, Davis and Schleifer, 1989
4. A Glossary of Literary Terms, M.H.Abrams, 2000
5. Modern Literary Theory: A Reader, Rice, Philip &Wagh, Patricia,1989

Pre Ph.D (English)

Course Title: Art of Fiction	Course Code: HCZ610
Credit: 4	L **4** T **0** P **0**
Year: **1st**	Semester: **I/II**

Unit 1History and Introduction to Fiction (12Hrs.)

1. The Meaning of Fiction
2. Fiction as a Genre
3. Types of Fiction
4. Development of the Novel
5. Four Wheels of the Novel
6. Novel in the 19th Century.

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Unit 3 Impact of Science on Fiction (12Hrs.)

1. Impact of Science and Technology on the Novel
2. Changing Social Realities and their Reflection in the Novel
3. Science-Fiction

Unit3 Elements and Structure of Modern Novel (12Hrs.)

1. Features of Modern Novel
2. Narrative Techniques
3. Plot and Structure
4. Art of Characterization.
5. Various Theories of Interpretation.
6. Development of Novel as 'Art Form' in India, America and Europe.

Suggested Books:

1. The Art of the Novel, Milan Kundra, 1995
2. The Aspects of the Novel, E.M.Forster, 1990
3. The Craft of Fiction, Lubbock, Percy ,1957
4. Character and the Novel, Harvey, W.J. 1965
5. The Rhetoric of Fiction, Booth, Wayne C. 1961

Pre Ph.D (English)

Course Title: Literature of Diaspora	Course Code: HCZ620
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: **I/II**

Note: Section A is compulsory. Attempt two questions from Section B and Section C.

Section A

1. Diaspora: Meaning, origin, themes and types
2. Gayatri Spivak: 'Can the Subaltern Speak'

Section B (Detailed Study)

1. V.S.Naipaul: A House for Mr. Biswas
2. Chitra Banerjee Divakaruni: The Mistress of Spices
3. Anita Desai: Bye Bye Blackbird
4. Vikram Seth: A Suitable Boy
5. Amitav Ghosh: The Calcutta Chromosome

Section C (Non-Detailed Study)

A collection of short stories

1. Bharati Mukherjee: Darkness
2. Rohinton Mistry: Tales from the Firozsha Baag
3. Jhumpa Lahiri: Unaccustomed Earth
4. Salman Rushdie: East, West
5. Vikram Chandra: Love and Longing in Bombay

SUGGESTED READING

1. V.S.Naipaul: A House for Mr. Biswas. Picador.2003.
2. Chitra Banerjee Divakaruni: The Mistress of Spices.Anchor.1998.
3. Anita Desai: Bye Bye Blackbird. Orient Paperbacks. 1971.
4. Vikram Seth: A Suitable Boy. Harper Collins (USA). 1993.
5. Amitav Ghosh: The Calcutta Chromosome. Picador.1995.
6. Bharati Mukherjee: Darkness. Fawcett Crest.1985.
7. Rohinton Mistry: Tales from the Firozsha Baag. McClelland & Stewart, 2000
8. Jhumpa Lahiri: Unaccustomed Earth. Alfred A Knopf (US). 2008.
9. Salman Rushdie: East, West. London: Vintage, 1995. Print.
10. Vikram Chandra: Love and Longing in Bombay. Kindle Edition. Faber & Faber. 2011.
11. Stephen Morton, Gayatri Spivak: Ethics, Subalternity and the Critique of Postcolonial Reason (Polity, 2007).
12. Homi K. Bhabha. The Location of Culture. Rutledge. 1991.

Pre Ph.D (English)

Course Title: English Language Teaching	Course Code: HCZ630
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: **I/II**

UNIT I

History of English Language Teaching with special reference to India

Theoretical Foundations of SLT/ELT: Linguistic theories for SLA (Contrastive Analysis, Error Analysis, Monitor Model Theory) Semantic Theories, Psychological approaches to language teaching (Piaget and Skinner), Universal Grammar Theory (Noam Chomsky), and Socio cultural Theory (Vygotsky)

UNIT II

ELT Methods and Approaches (Traditional to contemporary)

THE GRAMMAR TRANSLATION METHOD , THE DIRECT METHOD , ALTERNATIVE OR 'DESIGNER' METHODS; SUGGESTOPEDIA, THE SILENT WAY, TOTAL PHYSICAL RESPONSE. COMMUNICATIVE AND POST COMMUNICATIVE APPROACHES

UNIT III

Developing & Assessing Language Skill:

Teaching Listening, Speaking, Reading, Writing and Vocabulary

Assessment and Testing in Language classes

Evaluation procedures and instruments

UNIT IV

Teaching English language learners through technology

Use of ICT in Language Teaching facilitating e-tools, Managing teaching through virtual learning environment ,The potential of technology for language learning; Computer Assisted Language Learning.

Textbooks:

1. Agnihotry, R.K., and Khanna eds. English Language Teaching in India. (:Sage, New Delhi 1995).
2. Vyas, M.A. and Patel, Y.L. (eds.) Teaching English as a Second Language: A New Pedagogy for a New Century (Prentice-Hall India, New Delhi,2009).
3. Approaches and methods in language teaching (Second edition) by Jack C. Richards & Theodore S.Rodgers, Cambridge University Press,2001

Reference Books:

1. Gass, Susan M. and Selinker, Larry. Second Language Acquisition: An Introductory Course.(Routledge, London, 2001).
2. Brown, H.D. Principles of Language Learning and Teaching. (Longman, New York, 2006).
3. Nunan, D. Syllabus Design.Oxford: OUP,1994
4. Nunan, D. Task-based Language Teaching (Cambridge University Press, Cambridge, 2004).
5. Stern, H.H. Fundamental Concepts of Language Teaching (OUP, Oxford, 1983).
6. Tudor, Ian. The Dynamics of the Language Classroom (2001) (Prentice-Hall India, New Delhi, 2009).
7. Second language learning and language teaching (Fourth Edition) by Vivian Cook, Hodder Education, London, 2008
8. Research methods in language learning by David Nunan, Cambridge University Press, 1992 Practical English language teaching: Young Learners by Caroline T.Linse, McGraw Hill Companies Inc. New York, 2005
9. Teaching English language learners through technology by Tony Erben, Ruth Ban, Martha Castaneda, Routledge publication, New York 2009
10. English language learning and technology by Carol A Chapelle, John Benjamins Publishing Co, Philadelphia, 2003
11. Language testing and evaluation- an introductory course by Desmond Allison. Singapore University Press 1999.

Pre Ph.D (English)

Course Title: Seminar	Course Code: HCZ110
Credit: 1	L **2** T **0** P **0**
Year: **1st**	Semester: **I/II**

Faculty of Management Studies
DIT University Dehradun

Course Structure & Syllabus
for
Pre Ph.D. (Management) Course Work
Session: 2015-16

Pre Ph.D (Management)

Sr. No.	Course Code	Course Title	L	T	P	Credit
1	GBG010	Research Methods	4	0	0	4
2	GBG011	Advanced Data Analysis	4	0	0	4
3		Domain Specific Course 1	4	0	0	4
4		Domain Specific Course 2	4	0	0	4
5	GBZ110	Seminar	0	0	2	1
		Total Credits				**17**

List of Electives

S.No.	Subject Code	Course
1	GBZ610	Strategic Management
2	GBZ030.	Consumer Behavior
3	GBZ660	Talent and Acquisition Management
4	GBZ6A0	Organizational Behavior
5	GBZ6B0	Retail Management
6	GBZ6C0	Performance and Talent Management

Note : Apart from above listed Elective courses, Research Scholar may choose any course across departments being offered at PG level, if it is required/suggested by the Research Committee.

Pre Ph.D (Management)

Course Title: Research Methods			**Course Code: GBG010**
Credit: 4	**L**	**T**	**P**
	4	**0**	**0**
Year: 1st			**Semester: I**

Unit I: Fundamentals of Research:

Defining research, Objectives of research, types, research process, deductive and inductive reasoning; Identifying and formulating a research problem, Literature review: Search for existing literature (World Wide Web, Online data bases), Review the literature selected (Case studies, review articles and Meta-analysis), Develop a theoretical and conceptual framework, Writing up the review, Definition of variables : Concepts, indicators and variables, Types of variables, Types of measurement scales, Constructing the Hypothesis-Null(Research) and alternative, one-tailed and two-tailed testing, errors in testing. Ethical and Moral Issues in Research, Plagiarism, tools to avoid plagiarism – Intellectual Property Rights – Copy right laws – Patent rights

Unit II: Research Design:

Design of Experiments: Research Designs -Exploratory, Descriptive and Experimental, Experimental designs- Types of Experimental Designs

Unit III: Sampling, Sampling distribution, and Data Collection

Sampling distribution, Normal and binomial distribution, Reasons for sampling, sampling technique, sampling errors. Sources of Data-Primary Data, Secondary Data, Data Collection methods

Unit IV: Statistical Data Analysis:

Descriptive and inferential statistical analysis. Testing of hypothesis with Z-test, T-test and its variants, Chi-square test, ANOVA, Correlation, Regression Analysis, Introduction to data analysis data using SPSS20.0

Unit V Research Report:

Writing a research report- Developing an outline, Formats of Report writing, Key elements- Objective, Introduction, Design or Rationale of work, Experimental Methods, Procedures, Measurements, Results, Discussion, Conclusion, Referencing and various formats for reference writing of books and research papers, Writing a Research Proposal.

Text Book:

1. *Ganesan R, Research Methodology for Engineers , MJP Publishers, Chennai. 2011*

References Books:

1. *C.R.Kothari, "Research Methodology", 5th edition, New Age Publication,*
2. *Cooper, "Business Research Methods", 9th edition, Tata McGraw hills publication*
3. *Walpole R.A., Myers R.H., Myers S.L. and Ye, King: Probability & Statistics for Engineers and Scientists, Pearson Prentice Hall, Pearson Education, Inc. 2007.*
4. *Anderson B.H., Dursaton, and Poole M.: Thesis and assignment writing, Wiley Eastern 1997.*
5. *Bordens K.S. and Abbott, B.b.: Research Design and Methods, Mc Graw Hill, 2008.*
6. *Morris R Cohen: An Introduction to logic and Scientific Method (Allied Publishers)*

Pre Ph.D (Management)

Course Title: Advanced Data Analysis			**Course Code: GBG011**
Credit: 4	**L**	**T**	**P**
	4	**0**	**0**
Year: 1st			**Semester: I**

UNIT-1: Measures of Central Tendency and Dispersion

mean, median, mode, Properties and applications, Range, Mean deviation, Standard deviation, Coefficient of Variation, Skewness, Kurtosis.

UNIT-II Probability and Probability Distributions

Sample space and Events, The addition rule and complements Conditional Probability & the General Multiplication Rule. Random variable (discrete and continuous) and probability distribution, Properties of the Normal Distribution, The Binomial Probability Distribution, The Poisson Probability Distribution

UNIT-III Hypothesis Testing, Descriptive and Inferential Statistics:

Sampling theory; Formulation of Hypotheses; Testing hypothesis using Z test, t-test, F-test and Chi-Square test. Correlation, Linear regression (Least-Squares method),

UNIT-IV Advanced data Analysis Tools-1:

Multiple regression, Discriminant Analysis, Logistics Regression, Cluster Analysis

UNIT-V Advanced data Analysis Tools-2:

Conjoint Analysis, Multi-Dimensional Scaling, Factor Analysis (Exploratory and Confirmatory), Structural Equation Modelling.

Text Books

1. *Marketing research, Naresh Malhotra, 4th e, Pearson Publications*

Reference Books

2. *Multivariate Data Analysis, Joseph F. Hair Jr. William C. Black, Barry J. Babin, Rolph E. Anderson, Pearson Publication*

Pre Ph.D (Management)

Course Title: Consumer Behavior			**Course Code: GBZ030**
Credit: 4	**L**	**T**	**P**
	4	**0**	**0**
Year: 1st			**Semester: I**

Unit I: Introduction

Introduction to Marketing & Consumer Behavior, Psychology & Consumer Behavior, Buyer Various Aspects, Models of Comprehensive Buyer Behavior, Overview of Consumer Behavior Decision Process, Case study

Unit II: External Influencers

Culture, Social Class Variables Impacting Consumer Behavior, Sub Culture, Reference Group Variables Impacting Consumer Behavior, Family Variables Impacting Consumer Behavior, Learning and Memory, Case Study

Unit III: Psychological Influencers -1

Personality and concept of self, Motivation, Emotion, Perception, Information Processing, Problem Recognition, Individual Determinants of Consumer Behaviour – Needs and Motivation, Personality and Self Concept, Perception, Learning, Attitude

Unit IV: Business Buying Behaviour

Models of Industrial Buying Behavior, Patterns of Industrial Buying Behavior in India, Diffusion of Innovation, Perception, Trust, Selectivities, Cross-cultural Consumer Behavior, Case Study

Unit V: Selected Research Papers:

Four Research papers based on TAM, TRA,TPB, UTAUT, SOR models

. Text Books

1. *Consumer Behaviour, Shiffman and Kanuk , Pearson Publication, 5e.*

Reference Books:

1. *Hoyer, Wayne and Deborah McInnis. Consumer Behavior. Boston: Houghton Mifflin*
2. *Kardes, Frank (2008), Consumer Behavior Science and Practice, Sputh-Western*
3. *Solomon, Michael, Gary Bamossy, Søren Askegaard, and Maragreth Hogg (2009), Consumer Behaviour: A European Perspective, 3rd Edition, Pearson Roger D Blackwell ,Paul W Miniard ,James F Engel, ―Consumer Behavior‖, 1st India Edition, 2008, South Western*
4. *Del Hawkins, David Mothersbaugh, Amit Mookerjee, ―Consumer Behavior: Building Marketing Strategy‖, 11th Edition, 2010, , Tata McGraw Hill*

Pre Ph.D (Management)

Course Title: Retail Management			**Course Code: GBZ6B0**
Credit: 4	**L**	**T**	**P**
	4	**0**	**0**
Year: 1st			**Semester: I**

UNIT I: Nature and Importance of Retailing:

Basic terminologies in retail, history of retiling, the retail theories, paradigm shift in retailing, Retailing in the modern era. Market dynamics and SWOT analysis.

Reference paper: Retail Management Mr. Bankim R. Vaja, Ijrar- International Journal of Research and Analytical reviews, [volume 2 i issue 1 i jan.- march 2015]

UNIT II: Retail formats, Positioning & Promotion.

RETAIL FORMATS, CLASSIFICATION OF RETAILERS, E-RETAILING, POSITIONING & PROMOTION.

REFERENCE PAPER: ONLINE CONSUMER EXPERIENCE IN E-RETAILING: AN EMPIRICAL MODEL OF ANTECEDENTS AND OUTCOMES, SUSANROSE[A]MOIRACLARK[A1]PHILLIPSAMOUEL[B2]NEILHAIR[C3], JOURNAL OF RETAILING VOLUME 88, ISSUE 2, JUNE 2012, PAGES 308-322

UNIT III: **Location and Pricing in Retails**

Retail Perspective, Understanding the Retail Customer, Location strategy, Retail Pricing-Strategies and techniques.

REFERENCE PAPER: CUSTOMER EXPERIENCE MANAGEMENT IN RETAILING: AN ORGANIZING FRAMEWORK, DHRUVGREWAL[A]MICHAELLEVY[B1]V.KUMAR[C]JOURNAL OF RETAILING,VOLUME 85, ISSUE 1, MARCH 2009, PAGES 1-14

UNIT IV: **Merchandise and Store Management**

Merchandise and Store Management

Store functions and operations, Layout, Shrinkage and loss prevention, Merchandise selection and planning,7R model of merchandise planning process, category management.

UNIT V: **Creating & Sustaining Value and Trends in Retailing**

Retail Marketing Communication, Customer relationship management, Supply Chain Management. Mall Management.

Text Book:

1. Retail Marketing Management by David Gilbert, Pearson

Reference Books

1. Retail Marketing in modern age by Prashant Chaudhary, Sage
2. Retailing, Patrick. M. Dunne, Robert F. Lusch, David A. Griffth, Thomson.

Pre Ph.D (Management)

Course Title: Organizational Behaviour			**Course Code: GBZ6A0**
Credit: 4	**L**	**T**	**P**
	4	**0**	**0**
Year: 1st			**Semester: I**

UNIT-1: Organizational Behavior

Nature, Importance and Scope; Models of OB; Managing Workforce Diversity; Emerging Challenges for Management and OB, Determinants of Individual Behavior.

UNIT-2: Individual Behavior

Values, Attitudes, Personality, Perception and Emotions; Transactional Analysis; Johari Window; Motivation- Importance and Theories; Determinants of Personality; Personality Attributes influencing OB; Interactive Behavior and Interpersonal Conflict.

UNIT-3: Organization Structure

Foundations of Organizational Structure, Work Design and Technology, Organizational Culture & Climate, Organizational Learning- Importance and Theories; Learning and Behavior Modification; Principles of Learning & Reinforcement.

UNIT-4: Team Dynamics and Conflicts

Team Building and Group Dynamics; Working Teams and Team Effectiveness; Intra-Team Dynamics; Dynamics of Managerial Leadership; Leadership- Transition of Leadership Theories; Implementation of Leadership Theories in Contemporary Business Environment. Organization Conflicts, Power and Politics, Resolution of conflicts

UNIT-5: Research Papers:

Four research papers related to organization theories.

Text Book:

1. *Organizational Behaviour, Understanding and Managing life at work, 7th Ed., Johns, G., & Saks, A. Pearson.*

Reference Books:

1. *Johns, G., and Saks, Organizational Behaviour- Understanding and Managing life at work, 7th Ed., Pearson.*
2. *Gerard H. Seijts, Cases in Organization Behavior, 1st Edition, Sage.*
3. *Jerald Greenberg, Behavior in Organizations, 10th Edition, Prentice Hall.*
4. *Uday Pareek, Understanding Organizational Behavior, 3rd Edition, Oxford University Press,*

Pre Ph.D (Management)

Course Title: Performance and Talent Management			**Course Code: GBZ6C0**
Credit: 4	**L**	**T**	**P**
	4	**0**	**0**
Year: 1st			**Semester: I**

Unit1: Introduction to Performance Management

Evolution of Performance Management - Performance appraisal meaning and definition, performance management, Planning Managee Performance and Development - Monitoring Managee Performance & Mentoring Managee Development- Annual Stock Taking

Unit 2: Managing organizational and individual performance

Organisational and individual performance plans , Components of Managee performance and development plan, setting mutual expectations and performance criteria, Planning for Manager's performance and Development

Unit 3: Monitoring, Mentoring and Stocktaking

Supervision and Monitoring – process, periodic feedback, problem solving, Judgment vs analysis, efficient feedback , Tools for stocktaking

Unit 4: Performance Appraisal

Purpose, methods, 360 Degree performance appraisal, designing and implementing performance appraisal systems, Managing rewards on appraisals

Unit 5: Developing High Performers

Leadership and their role, Change Agents, Team oriented organizations, developing high performing teams

Text Book :

1. *Prem Chadha: Performance Management, Macmillan India, New Delhi, 2003.*

Reference Books :

1. *Prem Chadha: Performance Management, Macmillan India, New Delhi, 2003.*
2. *Michael Armstrong & Angela Baron, Performance Management: The New Realities, Jaico Publishing House, New Delhi, 2002.*
3. *T.V.Rao, Appraising amd Developing Managerial Performance, TV Rao Learning Systems Pvt Limited, Excel Books, 2003.*
4. *David Wade and Ronad Recardo, Corporate Performance Management, Butter Heinemann, New Delhi, 2002.*
5. *Henderson : Compensation Management in a Knowledge Based World 9/e Pearson Education.*

Pre Ph.D (Management)

Course Title: Strategic Management			**Course Code:** GBZ610
Credit: 4	**L**	**T**	**P**
	4	**0**	**0**
Year: 1st			**Semester: I**

UNIT-1:

Introduction: Basic concepts of strategic management. Strategic decision-making. levels. & Process of strategic management strategic intent: Vision, Mission, Goals and Objectives. Organization Appraisal–organizational capabilities in various Functional areas and Strategic Advantage Profile. Methods and techniques used for organizational appraisal (Value chain analysis, Financial and non financial analysis, historical analysis, Industry standards and benchmarking, balanced scorecard and key factor rating). Identification of Critical Success Factors (CSF).

UNIT-2:

Environmental Appraisal—Concept of environment, components of environment (Economic, legal, social, political and technological). Environmental scanning techniques- ETOP, QUEST and SWOT (TOWS)., External and internal assessments- porter's five force model, IFE, EFE & CPM matrix used for assessments.

UNIT-3:

Corporate level strategies-- Stability, Expansion, Retrenchment and CoMBTination strategies. Corporate restructuring. Concept of Synergy. Business level strategies— Cost leadership, Differentiation and Focus strategies Strategic Analysis and choice The input, matching (TOWS, SPACE, BCG IE,& grand strategy matrix) and Decision stages (QSPM) of strategic analysis choice.

UNIT-4:

Strategic Implementation-nature of strategic implementation, polcies, resouse allocation, managing conflicts, managing structure with strategy (functional structure, divisional structure, SBU), restructuring, Reengineering & E-engineering, managing resistance to change, strategic budget allocation, Human resource concerns while implementing Corporate cultre & leadership-Leading the strategic execution process.

UNIT-5:

Strategy review evaluation and control-Nature of strategy evaluation, strategy-evaluation framework, measuring organizational performance, taking corrective actions. Levels of strategic control, contingency planning & auditing. Managing strategic change-process, determining need for change, styles and tactics of change management.

Text Books:

1. Fred.R.David Strategic Management-concepts & cases-Prentice Hall Publication
2. A Thompson,Mararet A Peteraf, John E GaMBTle, A J Strckland, A K Jain.Crafting & Executing strategy-concepts and cases
3. Ansoff, H Igor - Corporate Strategy
4. Charles W L Hill and G R Jones- Strategic Management Theory
5. Azhar Kazmi - Business Policy

Reference Books:

1. Thomos L Wheelen and J D Hunger- Strategic Management
2. Hamel G and Prahalad C K - Competing for the Future

Pre Ph.D (Management)

Course Title: Talent and Acquisition Management			**Course Code:** GBZ660
Credit: 4	**L**	**T**	**P**
	4	**0**	**0**
Year: 1st			**Semester: I**

Unit 1: Talent Acquisition: Concept, Differentiate sourcing from selection, Acquisition work Flow, Job analysis, Person Job Fit and Person Organization Fit, Selection Methods, Legal Compliance , Halo Effect and Recency Effect, Interview, Interview Question design Candidate Evaluation, On-boarding , On-boarding Ideas

Unit 2: Basics of Talent Management - Talent:- engine of new economy, difference between talents and knowledge workers, leveraging talent, the talent value chain, elements of talent friendly organizations, talent management process.

Unit 3: Talent Management System - Components and benefits of Talent Management System; creating TMS, challenges of TMS; building blocks of talents management: competencies - performance management, evaluating employee potential

Unit 4: Talent Planning - Concept, succession management process; cross functional capabilities and fusion of talents; talent development budget, contingency plan for talent; building a reservoir of talent, compensation management within the context of talent management

Unit 5: Developing and Retaining Talent - Potential identification and development, employee retention-motivation and engagement, engaging talent through coaching and mentoring, Return on talent; developing talent management information system**.**

Text Books:

1. The Talent management hand Book, Lance A Berger & Dorothy R Berger, TMH
2. Chowdhary, Subir, The Talent Era, Pearson Education, New Delhi
3. Chowdhary, Subir, Management 21C, Financial Times/Prentice Hall International
4. Capelli Peter (2008). Talent on Demand: Managing Talent in Age of Uncertainty. Harvard Business Press.
5. Allan Schweyer (2004). Talent Management Systems: Best practices in Technology Solutions for Recruitment, Retention
6. Kavin Oaks & Pat Galagan,The Executive Guide to Talent Management, First Edition, ASTD, USA, 2011

Reference Books:

1. Lance A. Berger & Dorothy R. Berger,The Talent Management handbook, second edition, Tata McGraw-Hill, New Delhi,, 2011
2. Marshell Goldsmith & Louis Carter,Best Practices in Talent Management, First Edition, Wiley Publishers, San Francisco.
3. T.V Rao, Hurconomics for Talent Management, First Edition, Pearson, New Delhi, 2011.
4. Kaye Thorne & Andy Pellant, Guide to Managing Talent, First Edition, Page Publications, 2007.

Department of Mathematics
DIT University Dehradun

Course Structure & Syllabus
for
Pre Ph.D. (Mathematics) Course Work
Session: 2016-17

Pre Ph.D (Mathematics)

Sr. No.	Course Code	Course Title	L	T	P	Credit
1	GBG010	Research Methodology	4	0	0	4
2	JBA010	Advanced Mathematics	4	0	0	4
3		Elective 1	4	0	0	4
4		Elective 2	4	0	0	4
5	JDZ110	Seminar	0	0	2	1
		Total Credits				**17**

List of Elective

S.No.	Subject Code	Course
1	JDZ710	Fuzzy Sets and Applications
2	JDZ720	Advance Numerical Techniques
3	JDZ610	Integral Equations
4	JZZ620	Differential Equations
5	JDZ630	Magneto Hydrodynamics
6	JDZ640	Numerical Solution of Partial Differential Equations
7	JDZ650	Thermal Instabilities and Methods
8	JDZ660	Convection in Fluid and Porous Media
9	JDZ670	Computational Algebra

Note: Apart from above listed Elective courses, Research Scholar may choose any course across departments being offered at PG level, if it is required/suggested by the Research Committee.

Pre Ph.D (Mathematics)

Course Title: Research Methods			**Course Code: GBG010**
Credit: 4	**L**	**T**	**P**
	4	**0**	**0**
Year: 1st			**Semester: I**

Unit I: Fundamentals of Research:

Defining research, Objectives of research, types, research process, deductive and inductive reasoning; Identifying and formulating a research problem, Literature review: Search for existing literature (World Wide Web, Online data bases), Review the literature selected (Case studies, review articles and Meta-analysis), Develop a theoretical and conceptual framework, Writing up the review, Definition of variables : Concepts, indicators and variables, Types of variables, Types of measurement scales, Constructing the Hypothesis-Null(Research) and alternative, one-tailed and two-tailed testing, errors in testing. Ethical and Moral Issues in Research, Plagiarism, tools to avoid plagiarism – Intellectual Property Rights – Copy right laws – Patent rights

Unit II: Research Design:

Design of Experiments: Research Designs -Exploratory, Descriptive and Experimental, Experimental designs- Types of Experimental Designs

Unit III: Sampling, Sampling distribution, and Data Collection

Sampling distribution, Normal and binomial distribution, Reasons for sampling, sampling technique, sampling errors. Sources of Data-Primary Data, Secondary Data, Data Collection methods

Unit IV: Statistical Data Analysis:

Descriptive and inferential statistical analysis. Testing of hypothesis with Z-test, T-test and its variants, Chi-square test, ANOVA, Correlation, Regression Analysis, Introduction to data analysis data using SPSS20.0

Unit V Research Report:

Writing a research report- Developing an outline, Formats of Report writing, Key elements- Objective, Introduction, Design or Rationale of work, Experimental Methods, Procedures, Measurements, Results, Discussion, Conclusion, Referencing and various formats for reference writing of books and research papers, Writing a Research Proposal.

Text Book:

1. *Ganesan R, Research Methodology for Engineers , MJP Publishers, Chennai. 2011*

References Books:

1. *C.R.Kothari, "Research Methodology", 5th edition, New Age Publication,*
2. *Cooper, "Business Research Methods", 9th edition, Tata McGraw hills publication*
3. *Walpole R.A., Myers R.H., Myers S.L. and Ye, King: Probability & Statistics for Engineers and Scientists, Pearson Prentice Hall, Pearson Education, Inc. 2007.*
4. *Anderson B.H., Dursaton, and Poole M.: Thesis and assignment writing, Wiley Eastern 1997.*
5. *Bordens K.S. and Abbott, B.b.: Research Design and Methods, Mc Graw Hill, 2008.*
6. *Morris R Cohen: An Introduction to logic and Scientific Method (Allied Publishers)*

Pre Ph.D (Mathematics)

Course Title: Advanced Mathematics			**Course Code:** JBA010
Credit: 4	**L**	**T**	**P**
	4	**0**	**0**
Year: 1st			**Semester: I**

UNITI: Numerical Techniques

Zeros of Transcendental and Polynomial equation using bisection method; Newton-Raphson method; Rate of convergence of above methods. Interpolation: Finite differences; difference tables; Newton's Forward and Newton's Backward Interpolation; Lagrange's and Newton divided difference formula for unequal intervals. Solution of system of Linear equations: Gauss-Seidal method; Crout method. Numerical Integration: Trapezoidal rule; Simpson's one-third rule; Simpson's three-eighth rule; Solution of ordinary differential (first order, second order and simultaneous) equations by Picard's and Fourth order Runga - Kutta methods.

UNIT II: Partial Differential Equations (PDE)

Formation and Classification of PDE; Solution of One Dimension Wave Equation; and Heat Equation; Two Dimension Heat and Laplace Equation by Separation of variables Method.

UNIT III: Integral Equations

Introduction, Conversion of a linear differential equation to an integral equation and vice versa; Solution of an integral equation; Integral equations with separable kernels; Solution of Fredhlom and Volterra equation by the method of successive approximations.

UNIT IV: Special Functions

Series solution of ODE of 2^{nd} order with variable coefficient with special emphasis to Legendre and Bessel differential equation; Legendre polynomial of first kind; Bessel Function of first kind and their properties.

UNIT V: System of Ordinary Differential Equations

Matrix Theoryl; Solution of linear system of differential equations by Matrix method; Eigen values and Eigenvectors; Unitary; Hermitian and Normal matrices.

Text Books:

- **Advanced Engineering Mathematics**, R. K. Jain & S. R. K. Iyenger Narosa Publishing House, New Delhi, India, 2^{nd} Edition, 2006.
- **Numerical Methods for Scientific and Engineering computation,** M.K Jain, S.R.K Iyengar and R.K Jain, New age International Publishers, **4^{th}** Edition, 2003.

Reference Books:

- **Introductory Methods of Numerical Analysis,** S.S. Sastry, PHI learning Pvt. Ltd, 4^{th} edition, 2005.
- **Numerical Methods in Engineering and Science,** B. S. Grewal, Khanna Publishers, New Delhi, India, (9^{th} Edition), 2010.
- **Higher Engineering Mathematics**, B. S. Grewal, Khanna publication, New Delhi, India, 42th Edition, 2012.

Pre Ph.D (Mathematics)

Course Title: Fuzzy Sets and Applications	Course Code: JDZ710
Credit: 4	L: **4** T: **0** P: **0**
Year: 1st	**Semester: I/II**

Basic Concepts of Fuzzy Sets and Fuzzy Logic: Motivation. Fuzzy sets and their representations.

Membership functions and their designing. Types of Fuzzy sets. Operations on fuzzy sets. Convex fuzzy sets. Alpha-level cuts. Geometric interpretation of fuzzy sets. Linguistic variables. Possibility measure and distribution. Fuzzy rules. Fuzzy Relations and Fuzzy Arithmetic: Composition of fuzzy relations. Fuzzy numbers. Arithmetic operations on fuzzy numbers. Fuzzy reasoning.

Fuzzy mapping rules and fuzzy implication rules. Fuzzy rule-based models for function approximation. Types of fuzzy rule-based models (the Mamdani, TSK, and standard additive models).Fuzzy Implications and Approximate Reasoning:

Fuzzy Logic and Probability Theory: Possibility versus probability. Probability of a fuzzy event. Baye's theorem for fuzzy events. Probabilistic interpretation of fuzzy sets. Fuzzy measure.
Decision making in Fuzzy environment: Fuzzy Decisions, Fuzzy Linear programming, Fuzzy Multi criteria analysis, Multiobjective decision making.
Fuzzy databases and queries: Introduction, Fuzzy relational databases, Fuzzy queries in crisp databases.

Suggested Readings:

1. J. Yen and R. Langari: *Fuzzy Logic: Intelligence, Control, and Information,* Pearson Education, *2003.*
2. G. J. Klir and B. Yuan: *Fuzzy Sets and Fuzzy Logic: Theory and Applications,* Prentice-Hall of India, *1997.*
3. H.J. Zimmermann, Fuzzy Set theory and its applications, Kluwer Academic Publ, 2001.

Pre Ph.D (Mathematics)

Course Title: Advance Numerical Techniques	Course Code: JDZ720
Credit: 4	L T P **4 0 0**
Year: 1st	**Semester: I/II**

UNIT-I

Solution of algebraic and transcendental equations by Newton-Raphson method for simple and multiple roots and its convergence. Solutions of system of nonlinear equations by iteration and Newton-Raphson method. Lagrange's form of interpolating polynomial. Existence and uniqueness of interpolating polynomial.

UNIT-II

Least square method: Weighted least square approximation. Method of least square for continuous functions, orthogonal polynomials, Gram-Scmidt orthogonalization process and approximation of functions using Chebyshev polynomials.

UNIT-III

Numerical integration by Romberg method: Gaussian quadrature formula and error estimation. Numerical solution of initial value problem: Runge-Kutta method of order four for system of equations and for second and higher order differential equations. Boundary value problem by finite difference method and shooting method. Convergence of finite difference scheme.

UNIT-IV

Numerical Solution of PDE: Parabolic equations- Finite difference approximations to partial differential derivatives, explicit method and Crank-Nicolson method with stability analysis.

Elliptic equations: Standard five point formula, Jacobi's iteration method.

Hyperbolic equations: Explicit finite difference method.

Suggested Readings:

1) **Iyengar and Jain**: Numerical methods for Scientific and Engineering Computation.
2) **G. D. Smith**: Numerical Solution of Partial Differential Equations.
3) **Gerald & Wheatlay**: Applied Numerical Analysis.

Pre Ph.D (Mathematics)

Course Title: Integral Equations	Course Code: JDZ610
Credit: 4	L T P **4 0 0**
Year: 1st	**Semester: I/II**

Classification. Modeling of problems as integral equations. Conversion of initial and boundary value problem into integral equations. Conversion of integral equations into differential equations. Volterra integral equations and their numerical solutions. Greens function for Fredholm Integral equations. Fredholm integral equations: Degenerate kernels, symmetric kernels. Fredholm Integral equation of second kind. Numerical Solution of Fredholm Integral equations. Existence of the solutions: Basic fixed point theorems. Integral equations and transformations: Fourier, Laplace and Hilberttransformation.

Suggested Readings:

1. Abdul J. Jerry, Introduction to Integral Equations with applications, Marcel Dekkar Inc. NY.
2. L.G.Chambers, Integral Equations: A short Course, Int. Text Book Company Ltd. 1976,
3. R. P. Kanwal, *Linear Integral Equations*.
4. Harry Hochsdedt, *Integral Equations*.
5. Murry R. Spiegal, *Laplace Transform* (SCHAUM Outline Series), McGraw-Hill

Course Title: Differential Equations	Course Code: JZZ620
Credit: 4	L T P **4 0 0**
Year: 1st	**Semester: I/II**

Differential Equations

Existence and uniqueness of initial value problems, Picard's theorem. Analytical solutions of non-linear differential equations by asymptotic methods: variational approaches, parameter expanding methods, parameterized perturbation method, iteration perturbation method, homotopy methods. Greens function and boundary value problems.

First order PDE: method of characteristics, wave equation, weak solutions, system of PDE.

Linear PDE: dimensional analysis and self similarity, regular and singular perturbation, asymptotic and complete solution.

Non-linear PDE: conversion of non-linear PDE into linear PDE, some exactly solvable cases, Burger's equation, singular perturbation: boundary layer idea, shallow water theory.

Suggested Readings:

1. V. Lakshmikantham and V. Raghavendra , A text Book of Ordinary Differential Equations, Tata McGraw Hill,1997.
2. A.H. Nayfeh, Introduction to Perturbation methods, John Wiley, 1981.
3. F. Verhulst, Non-linear Differential Equations and Dynamical Systems, Springer, 1990.
4. P.Prasad and R .Ravindran, Partial Differential Equations, Wiley Eastern, 1985.
5. W.E. Williams, Partial Differential Equations, Oxford Univ. Press, 1980.
6. R.R. Garabedian, Partial Differential Equations, Wiley, 1984.
7. J. Kevorkian, Partial Differential Equations: analytical solution techniques, Springer, 2000.
8. H. Levine, Partial differential Equations, Amer. Math. Soc. Intl. Press, 1997.
9. G. I. Barenblatt, Scaling, Self-similarity and intermediate asymptotics, Cambridge Univ. Press, 1997.
10. L. Debnath, Non-linear Partial Differential Equations for Scientists and engineers, Birkhauser, 1997.

Pre Ph.D (Mathematics)

Course Title: Magneto Hydrodynamics	Course Code: JDZ630
Credit: 4	L: **4** T: **0** P: **0**
Year: 1st	**Semester: I/II**

Basic concepts of Magnetohydrodynamics and its applications, Maxwell's equations, Frame of reference, Lorentz force, Electromagnetic body force, Fundamental equations of MHD, Ohm's law for a moving conductor, Hall current, Conduction current, Kinematic aspect of MHD, Magnetic Reynolds number, MHD waves: alfven's waves, MHD waves in compressible fluid, MHD approximations, Electromagnetic boundary conditions, One dimensional MHD flow, Hartmann flow, MHD Couette flow, MHD Stoke's flow, MHD Rayleigh's flow, Hartmann-Stoke's boundary layer, Alfven's boundary layer, Two dimensional MHD flow (a) Aligned flow (b) Stagnation point flow, MHD flows in a rotating medium, Effects of Hall current on MHD flows in a rotating channel, MHD heat transfer.

Suggested Readings:

1. T.G.Cowling, Magnetohydrodynamics, Interscience Publishers New York, 1957.

2. J.A. Shercliff, A Text Book of Magnetohydrodynamics, Pergamon Press, Oxford, 1965.

3. S.I. Pai, Magnetohydrodynamics and Plasma Dynamics, Springer Verlag, New York, 1962.

4. K. R. Cramer and S. I. Pai, Magnetofluid Dynamics for Engineers and Applied Physicists, McGraw Hill, New York, 1973.

Pre Ph.D (Mathematics)

Course Title: Numerical Solution of Partial Differential Equations	Course Code: JDZ640
Credit: 4	L: **4** T: **0** P: **0**
Year: 1st	**Semester: I/II**

Numerical solutions of parabolic PDE in one space: two and three levels explicit and implicit difference schemes. Convergence and stability analysis.

Numerical solution of parabolic PDE of second order in two space dimension: implicit methods, alternating direction implicit (ADI) methods.

Nonlinear initial BVP. Difference schemes for parabolic PDE in spherical and cylindrical coordinate systems in one dimension. Numerical solution of hyperbolic PDE in one and two space dimension: explicit and implicit schemes.

ADI methods. Difference schemes for first order equations. Numerical solutions of elliptic equations, approximations of Laplace and biharmonic operators. Solutions of Dirichlet.

Neuman and mixed type problems. Finite element method: Linear, triangular elements and rectangular elements.

Practicals: Based on the above contents.

Suggested Readings:

1. M. K. Jain, S. R. K. Iyenger and R. K. Jain, *Computational Methods for Partial Differential Equations*, Wiley Eastern, 1994.
2. M. K. Jain, *Numerical Solution of Differential Equations*, 2nd edition, Wiley Eastern.
3. S. S. Sastry, Introductory *Methods of Numerical Analysis*, , Prentice-Hall of India, 2002.
4. D. V. Griffiths and I. M. Smith, *Numerical Methods of Engineers*, Oxford University Press, 1993.
5. C. F. General and P. O. Wheatley *Applied Numerical Analysis*, Addison- Wesley, 1998.

Pre Ph.D (Mathematics)

Course Title: Thermal Instabilities and Methods	Course Code: JDZ650
Credit: 4	L: **4** T: **0** P: **0**
Year: 1st	**Semester: I/II**

Mechanism of instability, various types of convection instabilities; Rayleigh-Benard convection, Oberbeck convection, magnetoconvection, Marangoni convection, magneto-Marangoni convection, magnetic fluid convection, electroconvection, double diffusive convection, cross diffusion convection, biconvection.

Boundary conditions. Techniques to solve linear and nonlinear instability problems; Galerkin technique, perturbation techniques involving regular and singular perturbations.

Truncated representation of Fourier series (finite amplitude technique), numerical techniques, moment method, energy method, power integral technique, Spectral method.

Suggested Readings:

1. D.A. Nield, A. Bejan, Convection in Porous Medium, Springer, 2006.
2. I.S. Shivakumara , M. Venkatachalappa, Advances in Fluid Mechanics, Vol 4, Tata McGraw-Hill, 2004.

Pre Ph.D (Mathematics)

Course Title: Convection in Fluid and Porous Media	Course Code: JDZ660
Credit: 4	L T P **4 0 0**
Year: 1st	**Semester: I/II**

Fundamentals of hydrodynamic stability, Rayleigh-Benard convection, concepts of porous medium, Darcy's law, Brinkman equation, equations for conservation of mass, momentum and energy in fluid and porous medium. Boussinesq approximations, boundary conditions, normal modes, cell patterns, heat and mass transfer in fluid and porous medium. Convection under rotation. Magnetic field and solute gradient. Nonlinear stability. Introduction to nanofluids, ferrofluids and polar fluids.

Suggested readings:

1. D.A. Nield , A. Bejan, Convection in porous medium, springer, 2006.
2. P.G. Drazin, W.H. Reid, Hydrodynamic stability, Cambridge Uni. Press, 1982.
3. S. Chandrasekhar, Hydrodynamic and Hydrmagnetic stability, Oxford Univ. Press, 1981.

Pre Ph.D (Mathematics)

Course Title: **Computational Algebra**	Course Code: JDZ670
Credit: 4	L T P **4 0 0**
Year: 1st	**Semester: I/II**

Rings, polynomial ring, and ring homomorphism, ideals: prime ideal, maximal ideal, radical of an ideal, polynomial ideal, operation on ideals, modules, module homomorphism, sub modules, quotient modules, finitely generated modules, exact sequences, modules of fractions, local ring, Noetherian ring, Noetherian module, Hilbert basis theorem.

Multivariate polynomial, monomial ordering, polynomial division algorithm, polynomial reduction, irreducibility, normal form, S-polynomial.

Gröbner bases & Buchberger's algorithm, algorithmic characterization of Gröbner bases by S- polynomials, application of Gröbner s bases: ideal membership, equality of ideals, radical membership, computation of syzyies, and dimension of ideals.

Suggested Readings:

1. Introduction to Commutative Algebra, M. F. Atiyah, I. G. Macdonald, Wesley, 1969.
2. Gröbner bases: A computational approach to commutative algebra, T. Becker & V. Weisfenning, Springer Verlag, New York 1993.
3. Ideals, varieties & algorithm: An introduction to computational algebraic geometry & Commutative algebra, D. Cox, J. Little, D O'shea,Sringer Verlag, New York 1992.
4. An introduction of Gröbner bases, W.W Adams & P. Loustaunau, Americans Mathematical Society, Providence, R I, 1994.
5. Gröbner bases & Application, B. Buchberger & F. Winkler, London Mathematical Society, Lecture note series 251, Cambridge University Press, 1998.
6. Polynomial algorithm in computer algebra, F. Winkler, Springer Verlag Wien, New York, 1996.

Department of Mechanical Engineering
DIT University Dehradun

Course Structure & Syllabus
for
Pre Ph.D. (Mechanical Engineering)
Course Work
Session: 2016-17

Pre Ph.D (Mechanical Engineering)

Sr. No.	Course Code	Course Title	L	T	P	Credit
1	GBG010	Research Methodology	4	0	0	4
2		Elective-I	4	0	0	4
3		Elective-II	4	0	0	4
4		Elective-III	4	0	0	4
5	LCZ110	Seminar	0	0	2	1
		Total Credits				**17**

List of Elective Subjects (Thermal)

Sl.No.	Course Code	Name of Subject
1	LBA610	Energy Efficient Buildings
2	LBA620	Gas Turbines and Compressors
3	LBA630	Design of Heat Exchangers
4	LBB610	Solar Energy Systems
5	LBB620	Computational Methods for Heat Transfer and Fluid Flow
6	LBB630	Wind Energy Engineering
7	LBB640	Fuel and Combustion Technology
8	LBB650	I.C. Engines Combustion Process & Modeling
9	LBB660	Energy Management, Audit and Conservation
10	LBB670	Advanced Refrigeration and Air Conditioning
11	LBB680	Conveectıve Heat and Mass Transfer

List of Electives (Design and Manufacturing)

Sl.No.	Course Code	Name of Subject
1	LCZ610	Fracture and Failure Analysis
2	LCZ620	Mechanism Design
3	LCZ630	Advanced Mechanics of Solids
4	LCZ640	Computer Control and Machining Tools
5	LCZ650	Advanced Optimization Techniques
6	LCZ660	Composite Materials
7	LCZ670	Computer Aided Design and Graphics
8	LCZ680	Material Processing Techniques
9	LCZ690	Numerical Methods
10	LCZ6A0	Experimental Design & Analysis
11	LCZ6B0	Material Characterisation
12	LCZ6C0	Advanced Manufacturing Techniques

Note: Apart from above listed Elective courses, Research Scholar may choose any course across departments being offered at PG level, if it is required/suggested by the Research Committee.

Pre Ph.D (Mechanical Engineering)

Course Title: **Research Methods**	Course Code: **GBG010**
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: I/II

UNIT 1: RESEARCH: MEANING AND SCOPE (5 Hrs)

Philosophy and Meaning of Research, Nature and Scope of Research, Nature of inquiry in Physical Science and Social Sciences, Difference between writing a popular article and research paper, Difference between writing a book and a dissertation

UNIT 2: **RESEARCH-METHODOLOGY AND APPROACHES (10 Hrs)**

Selection of Research Topic, Plan of Work, Thesis Statement and its Feasibility, Survey of different critical approaches, Selection of a particular approach, Micro and Macro analysis, The identification of the Research Problem, Problem of plagiarism, Material Collection: Primary and Secondary Sources, Reliability of Sources

UNIT 3: **PREPARATORY STEPS (7 Hrs)**

Writing the Synopsis, Literature Survey, The search for facts; the verification of facts, the analysis of evidence, trusty and causation, sources if prejudice and bias, Collection, Listing and Organization of Material, Library references; note- making, Use of Note-Cards and Reference Cards.

UNIT 4: **ESSENTIALS OF THESIS-WRITING (13 Hrs)**

Format and the Structure of a thesis, Single and Multi-Tier Division of Chapters, Writing of the Main Chapters, Preparation and Presentation of Conclusions, Foot Notes, Bibliography, Index, Quotation & Translation, Style: Paragraphing: Mechanics of Writing, The stylistics of thesis writing, Preparation of Manuscript and References, Proof reading, Documentation, Use of MLA Style Sheet

TEXT BOOK

1. The Art of Literary Research, R.D. Altick and J.J. Fenstermaker. The University of Michigan, 1963.
2. The MLA Style Sheet- recent edition.

REFERENCE BOOKS

1. The Craft of Research, Booth and Colomb. Chicago Guides to Writing, Editing, and Publishing.
2. Methodology and Methods of Linguistic Research, I.P. Ranspopov.
3. Literary Research Guide, J.L.Harner.2nd edn. New York Press, 1993.
4. Handbook of Literary Research, R.H. Miller. The Scarecrow Press, 1995.
5. G. Watson- The Literary Thesis
6. Jaeques Barzun and Henry F. Graft. The Modern Researcher, New York, Harcorurt, Brace & World, 1962.

Pre Ph.D (Mechanical Engineering)

Course Title: **Energy Efficient Buildings** ***(Elective)***	Course Code: **LBA610**		
Credit: 4	L	T	P
	4	**0**	**0**
Year: **1st**	Semester: I/II		

UNIT I
Architecture- Building Science and its significance. Indoor Environment. Components of Indoor Environment. Quality of Indoor Environment

UNIT II
Human Comfort-Thermal, Visual, Acoustical and Olfactory comfort. Concept of Sol-air temperature and its significance. Ventilation and is significance

UNIT III
Cooling and heating concepts, Passive concepts appropriate for the various climatic zones in India. Classification of building materials based on energy intensity.

UNIT IV
Energy Management of Buildings and Energy Audit of Buildings. - Energy management matrix monitoring and targeting.

UNIT V
Energy Efficient Landscape Design -Modification of microclimate through landscape elements for energy conservation.

REFERENCE BOOKS

1. Sodha M.,Bansal, N.K., Bansal,P.K., Kumar, A. and Malik, M.A.S., Solar Passive Buildings, Pergamon Press, 1986.
2. Koenigsberger, O.H., Ingersoll, T.G., Mayhew Alan and Szokolay, S.V., Manual of Tropical Housing and Building part 1: Climatic Design, OLBN 0 00212 0011,Orient Longman Limited, 1973.
3. Bureau of Indian Standards, I.S. 11907 –1986 Recommendations for calculation of Solar Radiation Buildings, 1986.
4. Givoni, B., Man, Climate and Architecture, Elsevier, Amsterdam, 1986.
5. Smith, R. J., Phillips, G.M. and Sweeney, M. Environmental Science, Longman Scientific and Technical, Essex, 1982.

Pre Ph.D (Mechanical Engineering)

Course Title: **Gas Turbines and Compressors** ***(Elective)***	Course Code: **LBA620**
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: I/II

UNIT I

Gas Turbines: Introduction, Thermodynamics of Axial Flow Turbine, Degree of Reaction, Preliminary Design Procedure for Turbine Stage.

UNIT II

Determination of Turbine Stage Efficiency, Axial Flow Turbine Performance, Compressor, Turbine Matching, Radial Inflow Gas Turbine, Thermodynamic Processes in Radial Inflow Gas Turbine.

UNIT III

Centrifugal Fans Blowers and Compressors: Classification Performance Parameters and Characteristics, Change of Performance, Polytropic Efficiency, Preliminary Design of Centrifugal Compressors.

UNIT IV

Axial Flow Compressors: Introduction. Basic Theory, Preliminary Design of Compressor Stage, Determination of Stage Efficiency, Axial Flow Compressor Performance, Surge and Stall in Compressor and the Remedies.

UNIT V

Gas Turbine Power Plants: Fuel and fuel feed systems; combustion systems-design considerations and flame stabilization; regenerator types and design; gas turbine power; plant performance and matching; applications.

Reference Books:

1. Ganesan, V., "Gas Turbines", Tata McGraw Hill, Publishing Company Ltd, 4th Reprint, 2002.
2. Saravanamuttoo, HIH, Rogers, GFC, Cohen, H., "Gas Turbine Theory", Pearson Education Ltd, 5th Edition, 2001.
3. Yahya, S.M., "Turbines Compressors and Fans", Tata McGraw Hill, Publishing Company Ltd, Second Edition, 2002.

Pre Ph.D (Mechanical Engineering)

Course Title: **Design of Heat Exchangers** ***(Elective)***	Course Code: **LBA630**
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: I/II

UNIT I
Classification of heat transfer equipment's, Specifications for heat exchangers, Standards of heat exchangers, design methodology, LMTD and NTU methods.

UNIT II
Design of double pipe heat exchanger-study and performance- Design of shell and tube heat exchanger.

UNIT III
Plate and spiral plate heat exchanger – plate heat exchanger for Dairy industry – Heat Pipes.

UNIT IV
Thermal design of heat exchange equipments such as Air pre-heaters, Economizer – Super heater and condensers.

UNIT V
Compact heat exchangers, Analysis and design of cooling towers.

Reference Books:

1. Kern, D. Q., "Process Heat Transfer," McGraw-Hill Book Co., N.Y. 1997.
2. Shah,R.K. and Sekulic,D.P., "Fundamentals of Heat Exchanger Design", John Wiley and Sons Inc., 2003.
3. Kokac, S., "Heat Exchangers-Thermal Hydraulic Fundamentals and Design", McGraw Hill.
4. Gupta, J. P. , `Heat Exchanger Design A Practical Look', Delhi: C. S. Enterprises, 1979.
5. Lienhard, J.H. and Lienhard, J.H., "A Heat Transfer Textbook", Phlogiston Press, Cambridge, Massachusetts, 2005.

Pre Ph.D (Mechanical Engineering)

Course Title: **Solar Energy Systems**	Course Code: **LBB610**
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: I/II

UNIT I

Introduction: Energy demand and supply, energy crisis, conventional and non-conventional energy resources, solar energy applications.

Solar Radiation: Sun, solar radiation, attenuation by atmosphere, solar radiation on earth, measurement, presentation and utilization of data.

UNIT II

Heat Transfer Concepts: Radiation characteristics of surface and bodies, absorbance, reflectance and transmittance, selective surface, sky radiation and wind convection.

Flat Plate Collectors: General description of flat plate collectors, general characteristics, performance, short term and long term performance, design.

UNIT III

Focusing Collectors: General description of focusing solar collectors, concentrators, receivers and orienting systems, general characteristics, performance, materials, design.

Energy Storage: Energy storage in solar process system, different types of storages, characteristics and capacity of storage medium, solar pond.

UNIT IV

Solar Heating and Cooling: Passive heating and cooling, nocturnal radiations, green house concept, ponds, active heating and cooling, solar water heaters, absorption cooling, combined solar heating and cooling systems, performance, economics of solar heating and cooling.

UNIT V

Solar Process Modeling: Solar process systems and components, component models, system models.

Solar Photovoltaics: Description and principle of working, performance characteristics, efficiency of solar cells, module design, PV systems, applications.

TEXT BOOKS

1. ArturV.Kilian., "Solar Collectors: Energy Conservation, Design and Applications", Nova Science Publishers Incorporated, 2009.
2. Soteris.A.Kalogiru., "Solar Energy Engineering: Processes and systems", 1st edition, Academic press, 2009.
3. K.Sukhatme, SuhasP.Sukhatme., "Solar energy: Principles of thermal collection and storage", Tata McGraw Hill, 8th edition, 2008.
4. Duffie, J. A. & W. A. Beckman., "Solar Engineering of Thermal Processes", 3rd edition, John Wiley & Sons, Inc., 2006.
5. H.P.Garg, J.Prakash., "Solar energy fundamentals and applications", Tata McGraw Hill, 2006.
6. D.YogiGoswami, Frank Kreith, Jan F.Kreider., "Principle of solar engineering", 2nd edition, Taylor and Francis, 2nd edition, 2003.
7. G.N.Tiwari., "Solar energy: Fundamentals, Design, Modeling and Applications", CRC Press Inc., 2002.

Pre Ph.D (Mechanical Engineering)

Course Title: **Computational Methods For Heat Transfer & Fluid Flow** ***(Elective)***			Course Code: **LBB620**
Credit: 4	L	T	P
	4	**0**	**0**
Year: **1st**			Semester: I/II

UNIT I

Review of basic fluid mechanics and the governing (Navier-Stokes) equations. Types of partial differential equations- hyperbolic, parabolic and elliptic. Traditional solution methods- method of characteristics, separation of variables, Greens function method.

UNIT II

Preliminary computational techniques: Discretisation, converting derivatives to discrete algebric expressions, spatial derivatives, time derivatives. Approximation of derivatives, Taylor series expansion, general techniques. Accuracy of discretisation process-higher order vs lower order formulae.

UNIT III

Finite difference method: conceptual implementation, application to transient heat conduction problem. Convergence, consistency and stability of FD equation.

UNIT IV

Weighted residual methods: General formulation, Introduction to Finite Volume method, Equations with first derivatives and second derivatives. FV method applied to Laplace's equation.

UNIT V

Finite Element method: Linear interpolation, quadratic interpolation, two dimensional interpolations. Application to heat transfer problems.

REFERENCE BOOKS

1. Ferziger, J.H. and Peric, M.,"Computational Method for Fluif Dynamics", Springer-Verlag Berlin Heidelberg, 2002.
2. Anderson, J.D., "Computational Fluid Dynamics",McGraw-Hill Publication, 1995.
3. Murlidhar, K. and Sundararajan, T., "Computational Fluid Flow and Heat Transfer", Narosa Publications, 2nd Edition, Reprint 2014.

Pre Ph.D (Mechanical Engineering)

Course Title: **Wind Energy Engineering** ***(Elective)***	Course Code: **LBB630**
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: I/II

UNIT I

Wind Energy Fundamentals: Wind Energy Basics, Wind Speeds and scales, Terrain, Roughness, Wind Mechanics, Power Content, Class of wind turbines, Atmospheric Boundary Layers, Turbulence.

UNIT II

Wind Measurements, Analysis and Energy Estimates: Instrumentation for wind measurements, Wind data analysis, tabulation, Wind resource estimation, Betz's Limit, Turbulence Analysis, Aerodynamics Theory: Airfoil terminology, Blade element theory, Blade design, Rotor performance and dynamics, Balancing technique (Rotor & Blade), Types of loads; **Sources of loads.**

UNIT III

Wind Turbines Technology & Components: Wind turbines types:
Vertical Axis Type, Horizontal Axis, Constant Speed Constant Frequency, Variable speed Variable Frequency, Up Wind, Down Wind, Stall Control , Pitch Control, Gear Coupled Generator type, Direct Generator Drive ,PMG,Rotor Excited Sync Generator

UNIT IV

Wind Turbine Control & Monitoring System: Details of Pitch System & Control Algorithms, Protections used & Safety Consideration in Wind turbines, Wind Turbine Monitoring with Error codes, SCADA & Databases

UNIT V

Concept of Wind Farms and project cycle: Project planning, Site selection, Project execution, Operation and maintenance. Environmental concerns & Cost Economics

REFERENCE BOOKS

1. Wind energy Handbook, Edited by T. Burton, D. Sharpe, N. Jenkins and E. Bossanyi, John Wiley & Sons, 2001
2. Wind and Solar Power Systems, Mukund. R. Patel, 2nd Edition, Taylor & Francis, 2001.
3. L .L. Freris, Wind Energy Conversion Systems, Prentice Hall, 1990.
4. D. A. Spera, Wind Turbine Technology: Fundamental concepts of Wind Turbine Engineering, ASME Press.
5. Anna Mani & Nooley, "Wind Energy Data for India", 1983.

Pre Ph.D (Mechanical Engineering)

Course Title: **Fuel and Combustion Technology** ***(Elective)***	Course Code: **LBB640**
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: I/II

UNIT I

Fuels & Fuel Analysis: Combustion Stoichiometry, theoretical & actual combustion processes, Air fuel ratio.

UNIT II

Combustion Thermodynamics calculation of heat of formation & heat of combustion – First law analysis of reacting systems.

UNIT III

Heat Treatment Furnaces: Industrial furnaces – process furnaces – Kilns – Batch & continuous furnaces.

UNIT IV

Flame, Flame Structure, Ignition and Igniters: flame propagation – deflagration – detonations-flame front – Ignition – self & forced ignition – Ignition temperature.

UNIT V

Combustion Appliances: Gas burners- Functional requirement of burners – Gas burner Classification –Stoker firing –pulverized system of firing.

REFERENCE BOOKS

1. Turns, S.R., An Introduction to Combustion: Concepts and Applications, 2nd ed., McGraw Hill, 2000.
2. Sharma, S.P. and Mohan, C., Fuels and Combustion, Tata McGraw-Hill, 1987.
3. Sarkar. S., Fuels and Combustion, Orient Longman, 2005.
4. Combustion Fundamentals, Roger Astrehlow, McGraw Hill
5. Combustion Engineering and Fuel Technology, Shaha A.K., Oxford and IBH.
6. Principles of Combustion ,KannethK.Kuo, Wiley and Sons.
7. An Introduction to Combustion , Stephen R. Turns, Mc. Graw Hill International Edition.
8. Combustion Engineering, Gary L.Berman & Kenneth W.Ragland, McGraw Hill International Edition.

Pre Ph.D (Mechanical Engineering)

Course Title: **I.C. Engine Combustion Process & Modeling** ***(Elective)***	Course Code: **LBB650**
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: I/II

UNIT I
Combustion process in CI and SI engines, flame structure and speed, spray structure.

UNIT II
Engine combustion modeling-overview, Modeling of flame propagation and heat release, burning speed, flame propagation relation.

UNIT III
Knock fundamentals, auto ignition, knock models.

UNIT IV
Modeling spray, spray equation, droplet kinematics, fuel vaporization.

UNIT V
Modeling pollutant and soot formation in engines.

REFERENCE BOOKS

1. V.Ganesan, Computer Simulation of Spark Ignition Engine Processes, Universities Press, 1995.
2. Ashley S. Campbell, Thermodynamic Analysis of Combustion Engines, John Wiley and Sons, 1980.
3. V.Ganesan, Computer Simulation of Compression Ignition Engine Processes, Universities Press, 2002.
4. Gordon P. Blair, The Basic Design of two-Stroke engines, SAE Publications, 1990.
5. Horlock and Winterbone, The Thermodynamics and Gas Dynamics of Internal Combustion Engines, Vol. I & II, Clarendon Press, 1986.
6. J.I.Ramos, Internal Combustion Engine Modeling, Hemisphere Publishing Corporation, 1989.
7. J.N.Mattavi and C.A.Amann, Combustion Modeling in Reciprocating Engines, Plenum Press, 1980.

Pre Ph.D (Mechanical Engineering)

Course Title: **Energy Management, Audit and Conservation** ***(Elective)***		Course Code: **LBB660**
Credit: 4	L **4**	T **0**	P **0**
Year: **1st**		Semester: I/II

UNIT I

Energy Scenario - Basics of Energy and its various forms , Energy Management and Audit , Material and Energy Balance , Energy Action Planning, Financial Management , Project Management , Energy Monitoring and Targeting , Global Environmental Concerns.

UNIT II

Energy Audit -various Energy Conservation Measures in Steam -Losses in Boiler. Energy Conservation in Steam Systems, Case studies.

UNIT III

Energy conservation- Centrifugal pumps, Fans & Blowers, Air compressor – energy consumption & energy saving potentials – Design consideration.

UNIT IV

Refrigeration & Air conditioning - Heat load estimation -Energy conservation in cooling towers & spray ponds – Case studies Electrical Energy -Energy Efficiency in Lighting – Case studies.

UNIT V

Organizational background desired for energy management motivation, detailed process of M&T-Thermostats, Boiler controls- proportional, differential and integral control, optimizers; compensators.

REFERENCE BOOKS:

1. Eastop T.D & Croft D.R, Energy Efficiency for Engineers and Technologists.
2. Logman Scientific & Technical, ISBN-0-582-03184, 1990.
3. Reay D.A, Industrial Energy Conservation, 1stedition, Pergamon Press, 1977.
4. Larry C Whitetal, Industrial Energy Management & Utilization.
5. Power System Engineering 2nd Ed. D P Kothari, I J Nagrath, Tata McGraw-Hill Co 2008.

Pre Ph.D (Mechanical Engineering)

Course Title: **Advanced Refrigeration and Air-conditioning** ***(Elective)***		Course Code: **LBB670**
Credit: 4	L **4**	T **0**	P **0**
Year: **1st**		Semester: I/II

UNIT I

Actual vapor compression system. Multipressure Systems , Cascade Systems-Analysis, Compressor-Types , performance , Characteristics of Reciprocating Compressors, Capacity Control , Types of Evaporators & Condensers and their functional aspects ,Expansion Devices and their Behavior with fluctuating load.

UNIT II

Vapor Absorption Systems-Aqua Ammonia &LiBr Systems, Steam Jet Refrigeration Thermo Electric Refrigeration, Air Refrigeration cycles.

UNIT III

Psychrometry: Moist Air properties , use of Psychrometric Chart , Various Psychrometric processes, Air Washer , Adiabatic Saturation. Summer and winter air conditioning: Air conditioning processes-RSHF , summer Air conditioning , Winter Air conditioning Bypass Factor. Applications with specified ventilation air quantity- Use of ERSHF, Application with low latent heat loads and high latent heat loads.

UNIT IV

Load estimation & air conditioning control: Solar radiation-heat gain through glasses, heat transfer through walls and roofs-Total cooling load estimation. Controls of temperature, humidity and air flow.

UNIT V

Air distribution: Flow through ducts , static & dynamic losses , air outlets , duct design–equal Friction method , duct balancing , indoor air quality , thermal insulation , fans & Duct system characteristics, fan arrangement variable air volume systems.

REFERENCE BOOKS

1. Arora C.P. , Refrigeration and Air Conditioning , Tata McGraw Hill, New Delhi, 2000.
2. Carrier Air Conditioning Co., Handbook of Air Conditioning Systems Design, McGraw Hill, 1985.
3. Langley, Billy C.; Refrigeration and Air Conditioning; 3rd Ed., Engie wood Cliffs (N.J) Prentice Hall 1986.
4. ASHRAE, Fundamentals and equipment, 4 volumes-ASHRAE Inc. 2005.
5. Jones, Air Conditioning Engineering, Edward Amold pub. 2001.
6. Stoecker W.F., Refrigeration and Air Conditioning, McGraw-Hill Book Company, 1989.
7. Jordan and Priester, Refrigeration and Air conditioning; 1985.
8. Goshnay W.B., Principles and Refrigeration, Cambridge University Press, 1985.

Pre Ph.D (Mechanical Engineering)

Course Title: **Convective Heat and Mass Transfer** *(Elective)*			Course Code: **LBB680**
Credit: 4	L	T	P
	4	**0**	**0**
Year: **1st**			Semester: I/II

UNIT I

Introduction: Reynolds Transport Theorem; Compressible and Incompressible Flows; Conservation equations; Preliminaries on the Tensor Analysis; Dimensionless Numbers; Concepts of velocity boundary layer and thermal boundary layer, displacement thickness, momentum thickness and energy thickness; velocity boundary layer and thermal boundary layer equations.

UNIT II

External Laminar Flows: Laminar boundary layer flow over a Flat Plate; Similarity and integral solutions. Viscous dissipation effects on flow over a flat plate.

External Turbulent Flows: Analogy solutions for boundary layer flows – Integral equation solutions – Effects of dissipation on flow over a flat plate. Analysis of Heat Transfer and Flow over Circular Cylinders and spheres.

UNIT III

Internal Laminar Flows: Analysis of Heat transfer in laminar developed and developing duct flows. Turbulent Flow and Heat transfer through a pipe; Chilton-Colburn Analogy, Reynolds' Analogy; Convection Correlations.

UNIT IV

Natural Convection: Boussineq approximation – Governing equations – Similarity – Boundary layer equations for free convective laminar flows – Numerical solution of boundary layer equations. Free Convective flows through a vertical channel across a rectangular enclosure – Horizontal enclosure – Turbulent natural convection.

UNIT V

Condensation: Nusselts theory of film condensation on a vertical plate-assumptions and correlations of film condensation for different geometries.

Boiling: Nucleation and Bubble Growth; pool boiling; Flow boiling; Correlations.

Convective Mass Transfer: Concentration boundary layer – Momentum, mass and heat transfer analogy – Convective mass transfer numbers – Flow over flat plates, flow through tubes – Correlations – Evaporation of water into air – Heat and mass transfer in separated flows.

REFERENCE BOOKS

1. Patrick H. Oosthuigen & David Naylor, Introduction to Convective Heat Transfer Analysis, McGraw Hill, 1999.
2. W. M. Kays and E. M. Crawford, Convective Heat and Mass Transfer, McGraw Hill, 1993.
3. Louis C Burmeister, Convective Heat Transfer, John Wiley and Sons, 1993.
4. Adrian Bejan, Convective Heat Transfer, John Wiley and Sons, 1995.

Pre Ph.D (Mechanical Engineering)

Course Title: **Fracture and Failure Analysis**			Course Code: LCZ610
	L	T	P
Credit: 4	**4**	**0**	**0**
Year: **1st**			Semester: I/II

Unit I Introduction of Engineering Fracture Mechanics: Review of tension test, bending and torsion. Method of handling combined stresses, principal stresses. Definition of failure, yield criteria, buckling as a failure mode. Need for fatigue test and data collection.

Unit II Spectacular Failures: Further details on Fatigue test, Review on conventional design methodologies. List of spectacular failures. Liberty ship failure, Ductile-brittle transition temperature and its relevance. Common applications of fracture/fracture prevention, Brief introduction to photoelasticity, Photoelastic appreciation of severity of a crack.

Unit III New test for fracture mechanics, Crack-growth curves, Residual strength diagram, Summary of fracture parameters. Practical examples of fracture, Typical photoelastic fringes for Mode-I, Mode-II and Mixed mode loadings.

Unit IV Fatigue Crack Growth Model: Geometric features of photo elastic fringes observed near the crack-tip. Multiple radial cracks in annular plates – its engineering relevance. Crack growth and fracture mechanisms. Shear-lip in necking. Fatigue crack growth model. Striations and Benchmarks.

Unit V Crack growth & Fracture Mechanics: Clarifications on fatigue crack growth model. Stress corrosion cracking (SCC) – Active path dissolution, Hydrogen embrittlement, Film induced cleavage. Creep, Corrosion fatigue, Liquid metal embrittlement. Fracture mechanisms – Brittle fracture, Ductile fracture.

Pre Ph.D (Mechanical Engineering)

Course Title: **Mechanism Design**	Course Code: LCZ620		
Credit: 4	L	T	P
	4	**0**	**0**
Year: **1st**	Semester: I/II		

UNIT – I Mobility analysis – Degree of freedom (DOF), mixed mobility, total, partial and fractional DOF. Closed and open chain systems, structural analysis and synthesis of mechanisms.

UNIT – II Alternative design solutions, coding, evaluation and selection of optimum mechanism, type synthesis, number synthesis and design of mechanisms.

UNIT – III Indexes of merit, graphical, algebraic and optimization techniques, matrix methods of design and analysis, design of function, path and motion generators, structural and mechanical error.

UNIT – IV Manipulators – Classification, actuation and transmission systems, coordinate transformation – DH notations, inverse and forward kinematics, manipulator dynamics from Lagrangian and Newtonian point of view.

BOOKS:

1. George N Sandor and Arthur G Erdman, Mechanism Design, VOL – 1, PHI, 1988
2. George N Sandor and Arthur G Erdman, Mechanism Design, VOL – 2, PHI, 1988
3. Mechanisms &Mechines (Analysis &Syntheis)by Arthur Erdman
4 .Klafter R.D., Cmielewski T.A. and NeginM ., "Robot Engineering An Intergrated approach", Prentice Hall of India,New Delhi,1994
5. Deb S.R. , "Robotics Technology and Flexible Automation", Tata McGraw Hill Publishing Co., Ltd.,1994

Pre Ph.D (Mechanical Engineering)

Course Title: **Advanced Mechanics of Solids**	Course Code: LCZ630		
Credit: 4	L	T	P
	4	**0**	**0**
Year: **1st**	Semester: I/II		

UNIT – I Shear Centre: Bending axis and shear center-shear center for axi-symmetric and unsymmetrical sections. Unsymmetrical bending, Bending stresses in Beams subjected to Nonsymmetrical bending; Deflection of straight beams due to nonsymmetrical bending.

UNIT – II Curved Beam Theory: Winkler Bach formula for circumferential stress – Limitations – Correction factors – Radial stress in curved beams – closed ring subjected to concentrated and uniform lads- stresses in chain links.

UNIT – III Torsion: Torsion of a cylindrical bar of Circular cross Section; Saint-Venant's semi-inverse methods; Linear elastic solution; Prandtl elastic membrane (Soap-Film) Analogy; Narrow rectangular cross Section; Hallow thin wall torsion members, Multiply connected Cross section, Thin wall torsion members with restrained ends Axi-Symmetric Problems: Rotating Discs – Flat discs, Discs of uniform thickness, Discs of Uniform Strength, Rotating Cylinders.

UNIT – IV Theory of Plates: Introduction; Stress resultants in a flat plate; Kinematics: Strain Displacement relations for plates; Equilibrium equations for small displacement theory of flat plates; Stress – Strain – Temperature relation for Isotropic plates: Strain energy of a plate, Boundary conditions for plate; Solution of rectangular plate problem; Solution of circular plate problem. Beams on Elastic Foundation: General theory; Infinite Beam subjected to Concentrated load; boundary conditions; Infinite beam subjected to a distributed lad segment; Semi-infinite beam with concentrated load near its end; Short Beams.

UNIT – V Contact Stresses: Introduction, problem of determining contact stresses; Assumptions on which a solution for contact stresses is based; Expressions for principal stresses; Methods of computing contact stresses; Deflection of bodies in point contact; Stresses for two bodies in contact over narrow rectangular area (Line contact), Loads normal to area; Stresses for two bodies in line contact. Normal and Tangent to contact area.

Books :

1. Advanced Mechanics of materials/Seely and Smith/ John Willey
2. Advanced Mechanics of materials / Boresi& Sidebottom/wiely international
3. Advanced strength of materials / Den Hortog J.P./Torrent
4. Theory of Plates /Timoshenko/
5. Strength of materials / Sadhu singh/ Khanna Publishers
6. Mechanics of Materials / Beer &Jhonson / McGraw Hill
7. Theory of Plates & Shells / Timoshenko/ McGraw Hill/ 2nd Edition

Pre Ph.D (Mechanical Engineering)

Course Title: **Computer Control and Machining Tools**	Course Code: LCZ640
Credit: 4	L T P **4 0 0**
Year: **1st**	Semester: I/II

Particulars	Hours
Unit 1: Introduction	
Introduction to numerical control, basic concepts, advantages of NC, Structure of NC Systems.	4
Unit 2: Machine Tools	
Types, Definition and designation of control axes, Constructional details of N. C. m/c tools, MCU structure and functions, Methods of improving accuracy and productivity using NC, Problems with conventional NC.	**7**
Unit 3: Part Programming	
Block format and codes, Tool length and radius compensation, Flexible tooling, Tool path simulation on lathe and milling, Advanced programming features. Tooling For N. C. Machines: Tool and zero presetting, Work holding and setting up of CNC machine	7
Unit-4: Numerical Control of M/c Tools	
NC, Functioning of NC, MCU Organization, CNC, DNC, Adaptive control types, Uses & benefits, Advantages of CNC, DNC their structure, Combined CNC/DNC systems, CNC part programing.	8
Unit- 5: Computer Assisted Part Programming	
Automatic NC program generation from CAD models; The APT language, Machining of surfaces, Introduction to Mould, Casting and Die design and manufacture using CAD/CAM software	8

REFERENCE BOOKS

1. Koren, Y., Computer Control of Manufacturing systems, McGraw Hill.

2. Kundra, T. K., Rao, P. N. and Tewari, N. K., Numerical Control and Computer Aided Manufacture, McGraw Hill.

3. Koren, Y. and Ben-Uri, J., Numerical Control of Machine Tools, Khanna Publishers.

4. Groover, M. P. and Zimmers, E. W., CAD/CAM, Prentice Hall of India.

Pre Ph.D (Mechanical Engineering)

Course Title: **Advanced Optimisation Techniques**	Course Code: LCZ650
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: I/II

Linear Programming: Geometry of linear programming, Graphical method, Linear programming (LP) in standard form, Solution of LP by simplex and revised simplex methods, Exceptional cases in LP, Duality theory, Dual Simple method, Sensitivity analysis.

(08)

Network Analysis: Transportation problem (with transshipment), Assignment problem, Traveling-salesman problem, Shortest route problem, Minimal spanning tree, Maximum flow problem.

(08)

Integer Programming: Branch and bound algorithm, Traveling salesman problem.

(06)

Dynamic programming: Forward recursions, General problem, Reliability problem, Capital budgeting problem, Cargo-loading problem.

(06)

CPM and PERT: Drawing of networks, Removal of redundancy, Network computations, Free slack, Total slack, Crashing, Resource allocation.

(08)

Non-Linear Programming: Characteristics, Concepts of convexity, maxima and minima of functions of n-variables using Lagrange multipliers and Kuhn-Tuker conditions, One dimensional search methods, Fibonacci, golden section method and gradient methods for unconstrained problems.

(08)

Text Books:

1. Taha, H.A., Operations Research: An Introduction, Prentice Hall of India (2007) 8th ed.
2. Kasana, H.S., Introductory Operation Research: Theory and Applications, Springer Verlag
3. Rardin, Ronald L., Optimization in Operations research, Pearson Education
4. Ravindran A, Phllips D.T. and Solberg J.J. Operation Research: Principles and Practice, John Wiley

Pre Ph.D (Mechanical Engineering)

Course Title: **Composite Materials**	Course Code: LCZ660
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: I/II

UNIT-I **Introduction:** Definition, Reason for composites, classification of composites, Raw materials, classification, Chemistry, Properties and applications. Matrix: Thermoplastics-Raw materials, Physical and chemical properties, Thermal behaviour and mechanical properties, Thermosets-Epoxy; Curing reactions, Hardener, Gel time Viscosity Modifications, Prepreg making, Unsaturated polyester resin; catalyst, curing reaction, Viscosity modifier, Alkyd Resin, Vinly ester, polyimides, Physical and chemical properties, Thermal behaviour, Mechanical Properties and uses, Elastomeric composites.

UNIT-II

Reinforcements; Types, Properties, Uses of silica, Titanium dioxide, Talc, Mica, etc., Flake, Fibres -Structure, property and applications of natural and synthetic fibres, organic and inorganic fibres. Example: Glass, Carbon, Aramid, Nylon, Boron, Aluminium carbide, Silk, Jute, Sisal, Cotton, etc, Coupling agents.

UNIT-III

Processing : Thermoplastic, Thermosets, etc., Types of methods, Processing conditions advantages and disadvantages, Film forming, Lamination, Sandwich, etc., Hand Layup methods, compression and Transfer molding, Pressure and Vacuum bag process, Filament winding, Spin coating, Pultrusion, Reinforced RIM, Injection molding of Thermosets, SMC and DMC, Factors affecting the performance of Composites. Testing of Composites; Destructive and non-destructive tests, Tensile, Compression, Flexural, ILSS, Impact strength, HDT, Basic Concepts of fracture mechanism.

UNIT-IV

Composite product design, Fundamentals, Definitions, Structure -Material -Design relationships, Design methodologies, Material Considerations, Application of Composites-Aerospace, Transport, marine, Structural, Chemical and Corrosion resistant products, sports, electrical, Electronic, Communication, Biomedical Applications, Repairs and maintenance, etc., Nanocomposites: -Types, preparation, characterization and applications.

Books :

1. Handbook of Composites by G. Lubin, Van Nostrand, New York, 1982.
2. Polymers and Polymer Composites in Construction L.C. Holleway,1990
3. Engineering plastics and Composites by John C.Bittence,1990
4. Handbook of Plastics, Elastomers and Composites by Charles A Harper,1975
5. Designing with Reinforced Composites - Technology Performance, Economics Rosato, 2nd ED.1997
6. Delwane Composite design Encyclopedia (Vol 3 Processing and Fabrication / Technology_ Ed. Leif A. Carlssen. and Joahn W. Hillispie, Technomic Publishing Ah. Lancaster U.S.A.
7. Fibre Glass Reinforced Plastics Nicholas P.Cheremisinoff and Composites Paul N.Cheremmisinoff., Noyes publications,N.J. U.S.A (1995)
8. Composite applications The Future is now, Thomas J. Drozdr, (Eds), Published by Society of Manufacturing Engineers, Michigan,1989.
9. Polymer Layered Silicate and silica nano Composites, Y.C.Ke,P.stroeve and F.s.Wang, Elesvier,2005
10. Hand Book of Plastics Testing Technology Vishu Shah, John Wiley & Sons, Inc NY. (1998)

Pre Ph.D (Mechanical Engineering)

Course Title: **Computer Aided Design and Graphics**	Course Code: LCZ670
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: I/II

UNIT-I Computer Graphics: Windowing and Clipping algorithms, Bresenham's Circle and ellipse generating algorithms, Three, Dimensional geometric transformations, multiple transformation.

Geometric Modelling: Dimensions of models, Types, Wire frame modeling, Solid modeling, Parametric representation of analytic curves-Line, Circle, Ellipse, parabola, hyperbola, conics.

UNIT-II -Parametric representation of Synthetic curves-Hermite cubic curves, Bezier curves, B-spline curves, rational curves. Curve manipulations-displaying, evaluating points on curves, Blending, segmentation, Trimming, Intersection. Surface models, surface entities, Parametric representation of analytic surfaces-planed and ruled surfaces, Surface of revolution, Tabulated cylinder, Parametric representation of synthetic surfaces-Hermite bicubic, Bezier and B-spline surfaces, Coons surface, offset surface, Triangular patches, sculptured surface, Rational parametric surface. Surface manipulations-Displaying, evaluating points & curves on surfaces, segmentation, Trimming, Intersection, Projection.

UNIT III- Assembly and Modelling Software Standards: Introduction, assembly modeling-Parts modeling and representation, Hierarchical relationships, Mating conditions. Inference of position from mating conditions. Representation schemes Graph structure, Location graph, Virtual link, generation of assembly sequences-Precedence diagram, Liasion-Sequence analysis, Precedence graph, Assembly analysis programs.

UNIT-IV Graphics database structure and handling, Operating features, Symbols, micros. Editing facility, Data selection, Graphic transformation, Plotting. Graphic standards-GKS and CORE, GKS-3D and PHIGS, IGES, Other graphic standards.

UNIT –V Introduction to Product Data Management (PDM): Present market constraints-need for collaboration Internet and developments in server-client computing. Components of PDM: Components of a typical PDM setup, hardware and document management, creation and viewing of documents, creating parts version, Control of parts and documents, case studies. Configuration Management: Base lines, product structure, configuration management, Products configuration, Comparison between sales configuration and products, Generic product modeling. Projects and roles: Creation of projects and roles, life cycle of a product, life cycle management, automation information flow, work flow, creation of work flow. Templates, life cycle, work now integration, Case studies.

Books:

1. Computer Graphics D Hearn & M P Baker Prentice Hall
2. CAD/CAM Theory and Practice Ibrahim Zeid& R Sivasubramanian Tata McGraw-Hill
3. Principles of Computer Graphics W.M. Neumann and F Robert McGraw-Hill Co., Singapore
4. Principles of CAD J Rooney &P Steadman Longman Higher Education
5. CAD/CAM H P Groover and E W Zimmers Prentice Hall
6. PDM: Product data Management Rodger Burden Resource Publishing

Pre Ph.D (Mechanical Engineering)

Course Title: **Material Processing Techniques**	Course Code: LCZ680		
Credit: 4	L	T	P
	4	**0**	**0**
Year: **1st**	Semester: I/II		

Unit:1 Processing of Powder-Metal, ceramics, glass. Introduction. Production of Metal Powders, Compaction of Metal Powders ,Sintering Secondary and Finishing Operations ,Design Considerations, Process Capabilities ,Ceramics, Glasses, and Superconductors

Unit2 Processing and Equipment, Introduction Shaping Ceramics, Forming and Shaping of Glass Techniques for Strengthening and Annealing Glass

Unit:3 Surface Technology : Surface Roughness and Measurement; Friction, Wear, and Lubrication Introduction : Surface Structure and Integrity ,Surface Texture and Roughness Friction ,Wear, Lubrication, Metalworking Fluids and Their Selection.,

Unit4: Surface Treatments, Coatings, and Cleaning Introduction: Mechanical Surface Treatments ,Mechanical Plating and Cladding Case Hardening and Hard Facing, Thermal Spraying ,Vapor Deposition ,Ion Implantation and Diffusion Coating ,Laser Treatments ,Electroplating, Electroless Plating, and Electroforming Conversion Coatings ,Hot Dipping Porcelain Enameling; Ceramic and Organic Coatings Diamond Coating and Diamond like Carbon, Surface Texturing, Painting Cleaning of Surfaces.

Unit:5. Experimental techniques of evaluation of friction in metal forming, influence of temperature and gliding velocity-friction and heat generation, friction between metal layers, surface treatment of drawing, sheet metal forming, extrusion and hot and cold forging. Processing of aluminum, cladding of AL alloys. Thermo mechanical Processing of Ferrous Alloys.

Books:

1.Advanced Machining Processes, V.K.Jain, Allied Publications

2.Process and Materials of Manufacturing, R. A. Lindburg, 4th edition, PHI 1990

3. Manufacturing Engineering & Technology, 6/E, Serope Kalpakjian,
Steven Schmid, PEARSON

Pre Ph.D (Mechanical Engineering)

Course Title: **Numerical Methods**	Course Code: LCZ690		
Credit: 4	L	T	P
	4	**0**	**0**
Year: **1st**	Semester: I/II		

1. Unit I Zeroes of transcendental and polynomial equation using Bisection method, Regula-falsi method and Newton- Raphson method, Rate of convergence of above methods.

2. Unit II **Interpolation:** Finite differences, difference tables, Newton's forward and backward interpolation, Lagrange's and Newton's divided difference formula for unequal intervals.

3. Unit III Solution of system of linear equations, Gauss- Seidal method, Crout method. Numerical differentiation, Numerical integration, Simpson's one third and three-eight rules, Solution of ordinary differential equations by Euler's, Picard's and forth-order Runge- Kutta mehthods.

4. Unit IV **Statistical Techniques – I:** Moments, Moment generating functions, Skewness, Kurtosis, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves etc., Correlation,Linear, non –linear and multiple regression analysis.

5. Unit V **Statistical Techniques – II:** Binomial, Poisson and Normal distributions, Sampling theory (small and large), Tests of significations: Chi-square test, z-test, Analysis of variance (one way) , Application to engineering, medicine, agriculture etc.

Pre Ph.D (Mechanical Engineering)

Course Title: **Experimental Design & Analysis**	Course Code: LCZ6A0		
Credit: 4	L	T	P
	4	**0**	**0**
Year: **1st**	Semester: I/II		

Unit I Stress: Introduction, Stress Equations of Equilibrium, Laws of Stress Transformations, principal Stresses, Strain: Introduction, Displacement and Strain, Strain Transformation Equation, Principal Strains, Stress Strain Relations, Strain Transformation Equations and Stress Strain Relations for Two-Dimensional State of Stress.

Unit II Strain Measurements: Introduction, Properties of Strain Guage Systems, Types of Strain Guages, Grid-Method of Strain Analysis. Failure Theories, Brittle Coating, Crack Patterns, Resin and Ceramic Based Brittle Coating, Test Procedure, Analysis of Brittle Coating Data.

Unit III Electrical Resistance Strain Gages: Introduction, Strain Sensitivity in Alloys, Strain Gage Adhesives, Gage Sensitivity and Gage Factor. Strain Gage Circuit: Potentiometer and its Application, Wheat-Stone Bridge, Bridge Sensitivity, Null Balance Bridges.

Unit IV System Theories: System Analysis, Black box approach, state theory approach, component integration approach, Decision process approach, A case study- automobile instrumentation panel system.

Unit V System modeling: Need of modeling, Model types and purpose, linear systems, mathematical modeling, concepts, A case study compound bar system.

ReferenceBooks:

1. Dow and Adams, "Experimental stress analysis and motion measurements", Prentice Hall.
2. Dally and Riley, "Experimental Stress Analysis", McGraw Hill.
3. Durelli, "Applied Stress Analysis", Prentice Hall.
4. Frocht, "Photoelasticity Vol. 1 & 2", John Wiley.
5. Durelli and Riley, "Introduction to Photomechanics", McGraw Hill.

Pre Ph.D (Mechanical Engineering)

Course Title: **Material Characterisation**	Course Code: LCZ6B0		
Credit: 4	L	T	P
	4	**0**	**0**
Year: **1st**	Semester: I/II		

Unit I Introduction to the course: Relevance of advanced characterization to materials development, scientific understanding of phenomena in materials technology.

Advanced Diffraction Techniques: Introduction; X-Ray, their production & properties. Review of basic diffraction theory

Unit II - Various SAXS techniques and its applications in characterizing materials SAXS, GISAXS, LEED and RHEED, EXAFS, SEXAFS/NEXAFS

Unit III Surface Characterization - Advanced Surface Characterization Techniques: XPS, AES & SIMS, Importance of surface characterization techniques, Physical principles of XPS, Photoelectric effects, Instrumentation, XPS patterns; Spin orbital Splitting; Quantitative analysis, Chemical effect, Chemical shift, XPS imaging Auger electron generation; Principle, Chemical effect, Quantitative analysis, Depth profiling, Applications

Unit IV Comparison surface analysis techniques.

Advanced Spectroscopic Techniques- Introduction, Electromagnetic spectroscopy, UV-Visible Spectroscopy, Photo-luminescence spectroscopy, Infra-red spectroscopy.

Unit V Advanced Microscopic Techniques: Introduction; Electron-materials interactions, TEM: HR, HAADF, STEM, In-situ TEM; SEM, EBSD, In-situ SEM

Pre Ph.D (Mechanical Engineering)

Course Title: **Advanced Manufacturing Techniques**	Course Code: LCZ6C0		
Credit: 4	L	T	P
	4	**0**	**0**
Year: **1st**	Semester: I/II		

Unit:1 Development and classification of non-conventional manufacturing processes, considerations in processes selection. Mechanics of material removal, tool design, effects of process parameters on MRR, accuracy and surface finish and applications of the various non-conventional machining processes.

Unit:2. Ultrasonic Machining (USM), abrasive & water jet machining (AJM), Electro Chemical Machines (ECM),. Electro Chemical Grinding (ECG), Chemical Machining (CHM), Electrical Discharge (EDM),
Machining

Unit 3: Electron Beam Machining (EBM) and lon Beam machining (IBM) processes. High Energy Rate Forming Methods (HERF).

Unit 4
Electrochemical Grinding, Electrical-discharge Machining, Laser-beam Machining, Electron-beam Machining, Water-jet Machining, Abrasive-jet Machining.

Unit 5 : Hybrid Machining Systems ,Economics of Advanced Machining Processes, High Velocity Forming of Metals, Explosive forming, Electro-hydraulic forming, magnetic pulse forming, Application of HE RF Techniques.

Books: :

1. Pandey & Shan, Modern Machining Processes, Tara McGraw Hill, N.Delhi
2. P.K Mishra, Non Conventional Machining, Narosa Publishing House, N.Delhi
3. Amitabh Bhattacharya, New Technology, Institution of Engrs (I) Calcutta
4. ASTME, High Velocity Forming of Metals, PHI, N.Delhi
5. Ghosh & Mullick, Manufacturing Science, New Age publishers Pvt. Ltd. N. Delhi
6. Serope Kalpak Jain & Steven R. Schmid, Manufacturing Engineering & Technology, Addison Wesley Ltd.. N. Delhi

Pre Ph.D (Mechanical Engineering)

Course Title: **Seminar**			Course Code: LCZ110
Credit: 1	L **0**	T **0**	P **2**
Year: **1st**			Semester: I/II

Department of Petroleum Engineering
DIT University Dehradun

Course Structure & Syllabus
for
Pre Ph.D. (PE) Course Work
Session: 2015-16

Pre Ph.D (PE)

Sr. No.	Course Code	Course Title	L	T	P	Credit
1	GBG010	Research Methods	4	0	0	4
2		Elective 1	4	0	0	4
3		Elective 2	4	0	0	4
4		Elective 3	4	0	0	4
5	MBZ110	Seminar	0	0	2	1
		Total Credits				**17**

List of Electives

S.No.	Subject Code	Course Title
1	MBZ610	Reservoir Simulation
2	MBZ620	Petroleum Production Engineering
3	MBZ630	Enhanced Oil Recovery Techniques
4	MBZ640	Reservoir Engineering
5	MBZ650	Non-Conventional Petroleum Resources
6	MBZ660	Drilling Fluids and Cements
7	MBZ670	Oil and Gas Well Drilling

Pre Ph.D (PE)

Course Title: **Research Methods**	Course Code: GBG010
Credit: 4	L **4** T **0** P **0**
Year: **1st**	Semester: **I/II**

UNIT 1: RESEARCH: MEANING AND SCOPE (5 Hrs)

Philosophy and Meaning of Research, Nature and Scope of Research, Nature of inquiry in Physical Science and Social Sciences, Difference between writing a popular article and research paper, Difference between writing a book and a dissertation

UNIT 2: **RESEARCH-METHODOLOGY AND APPROACHES (10 Hrs)**

Selection of Research Topic, Plan of Work, Thesis Statement and its Feasibility, Survey of different critical approaches, Selection of a particular approach, Micro and Macro analysis, The identification of the Research Problem, Problem of plagiarism, Material Collection: Primary and Secondary Sources, Reliability of Sources

UNIT 3: **PREPARATORY STEPS (7 Hrs)**

Writing the Synopsis, Literature Survey, The search for facts; the verification of facts, the analysis of evidence, trusty and causation, sources if prejudice and bias, Collection, Listing and Organization of Material, Library references; note- making, Use of Note-Cards and Reference Cards.

UNIT 4: **ESSENTIALS OF THESIS-WRITING (13 Hrs)**

Format and the Structure of a thesis, Single and Multi-Tier Division of Chapters, Writing of the Main Chapters, Preparation and Presentation of Conclusions, Foot Notes, Bibliography, Index, Quotation & Translation, Style: Paragraphing: Mechanics of Writing, The stylistics of thesis writing, Preparation of Manuscript and References, Proof reading, Documentation, Use of MLA Style Sheet

TEXT BOOK

1. The Art of Literary Research, R.D. Altick and J.J. Fenstermaker. The University of Michigan, 1963.
2. The MLA Style Sheet- recent edition.

REFERENCE BOOKS

1. The Craft of Research, Booth and Colomb. Chicago Guides to Writing, Editing, and Publishing.
2. Methodology and Methods of Linguistic Research, I.P. Ranspopov.
3. Literary Research Guide, J.L.Harner.2nd edn. New York Press, 1993.
4. Handbook of Literary Research, R.H. Miller. The Scarecrow Press, 1995.
5. G. Watson- The Literary Thesis
6. Jaeques Barzun and Henry F. Graft. The Modern Researcher, New York, Harcorurt, Brace & World, 1962.

Pre Ph.D (PE)

Course Title: Reservoir Simulation	Course Code: MBZ610
Credit: 4	L **4** T **0** P **0**
Year: **1st**	Semester: **I/II**

UNIT – 1 6 L

Model types:Physical, analog and mathematical. Single-phase, multi-phase in one, two and three dimension mathematical model for reservoir fluid flow. Grid blocks and Grid orientation.

UNIT – 2 6 L

Model Equations: Black oil and composition models. Pseudo functions. Data Preparation: Rock, fluid, mechanical, production and validation

UNIT – 3 10 L

Solution Techniques: Analytical and numerical methods, explicit and implicit methods of discretization, finite-difference and finite element method, linearization, solution of simultaneous equations.

UNIT – 4 8 L

Stability criteria, Iterative methods, IMPES & IMPIS methods. Numerical dispersion. Grid and time step size selection. History matching: Manual and automated system Reservoir performance using simulation approach.

UNIT – 5 10 L

Simulating special processes: Compositional simulation, Miscible displacement, chemical and polymer flooding, thermal recovery processes.

Books:

1. Basic Applied Reservoir Simulation by T. Ertenim, J.H Abou-kassem and G.R. King, SPE Text book series.
2. Notes on reservoir simulation, Institute of Petroleum Engineering, Herriot-watt University.
3. Principles of Applied Reservoir Simulation, byJ.R.Fanchi, Gulf Publication.

Pre Ph.D (PE)

Course Title: Petroleum Production Engineering	Course Code: MBZ620
Credit: 4	L **4** T **0** P **0**
Year: **1st**	Semester: **I/II**

UNIT – 1 **8L**

Production well equipment: tubing heads, Christmas tree valves and chokes, flow tubing and flow line performance.

UNIT – 2 **8L**

Self-flow well characteristics, productivity and GOR, fluid production handling system, group gathering station, layout separation system.

UNIT – 3 **10L**

Artificial-lift methods of production: continuous gas-lift and intermittent gas lift: principle, system and performance. Sucker rod pumping methods: system characteristics, plunger and rod stress conditions. Dynamometer system and applications, down hole pumping system.

UNIT – 4 **8L**

Extraneous Gas and water entry in to well bore; source identification and control measures, Sand production and control: Sand control techniques, produced sand analysis, gravel size selection, gravel-packing fluid and gravel packing techniques.

UNIT – 5 **6L**

Well work-over problems, rig selection, Rigless work-over, coiled tubing system. Work-over fluid design. Planning and economics

Books:

1. Production Operations Vol.- 1 & Vol. 2, Thomas O. Allen & Alan P. Roberts.
2. Surface production Operation Vol.-1 & Vol. 2, Ken Arnold & Maurice Stewart
3. Well Completion and Servicing, D. Perrin, Editions Technip
4. The Technology of Artificial Lift Methods, Vol, 1, Kermit E. Brown, H. Dale Beggs

Pre Ph.D (PE)

Course Title: Enhanced Oil Recovery Techniques	Course Code: MBZ630
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: **I/II**

Unit 1:	
Principles and Mechanism. Screening criteria, Macroscopic displacement of fluids: Areal sweep efficiency. Vertical sweep efficiency Displacement efficiency, mobility ratio, well spacing.	9
Unit 2:	
Water flooding in reservoir: Equation of motion. Continuity, solution methods, Pattern flooding, recovery etc., permeability heterogeneity.	9
Unit 3:	
Chemical flooding: Polymer flood; mobility control in-situ permeability modification, foam flooding; WAG process. Surfactant flooding, miscellar/polymer flooding, micro emulation phase behavior, wettability modification, Alkaline flooding.	7
Unit-4:	
Miscible displacement processes – miscibility condition, high pressure gas injection, enriched gas injection, LPG flooding, carbon dioxide flooding, alcohol flooding.	8
Unit- 5:	
Thermal Recovery processes: Hot water flooding, steam flooding, cyclic steam injection, in-situ combustion, air requirement; combustion front monitoring, microbial oil recovery.	7
TEXT BOOKS	
1. Bradley H B, Petroleum Engineering Handbook, third edition, SPE. 2. Enhanced Oil Recovery; Teknica; Teknica Petroleum Services Ltd.; Calagry, Alberta.	
REFERENCES	
1. Lake L., "Enhanced Oil Recovery". 2. Green D W and Willhite G P, "Enhanced Oil Recovery", SPE, 2003, 556 pp.	

Pre Ph.D (PE)

Course Title: Reservoir Engineering	Course Code: MBZ640
Credit: 4	L **4** T **0** P **0**
Year: **1st**	Semester: **I/II**

UNIT – 1 8L

Reservoir rock properties: Measurement of Porosity and packing arrangement, Permeability and combination of permeability in parallel & series beds, Porosity permeability relationship, Klinkenberg effect, Capillary pressure, Capillary hysteresis, Interfacial tension measurement: evaluation. Fluid saturation, Effective and relative permeability, Wettability, Evaluations and significance, WOC, GOC and Transition zone.

UNIT – 2 10L

Reservoir Fluid System: Volumetric and phase behavior of multi-component oil/ gas system, Formation volume factor for oil and gas and evaluation & significance, Viscosity of oil & gas, Reservoir fluid sampling methods, PVT properties: measurement, estimation and application, Gas compressibility factor, Standing & Katz Chart.

UNIT – 3 8L

Fluid flow through Porous media: Darcy's law, Single and multi-phase system, Linear, Radial and Spherical flow, Oil and gas field development: Water flood performance, Injection-Production wells distribution patterns and characteristics

UNIT – 4 6L

Reservoir drives: Depletion drive, water drive, gas cap drive, combination drive, and recovery factor, Reserve estimation: Resource and reserve, SPE classification of reserve, Volumetric reserve estimation and MBE. Havlena and Odeh method, Rock and fluid compressibility factor; Recovery factor estimation.

UNIT – 5 8L

Immiscible displacement process: Fractional flow and fractional displacement process in linear reservoir, Buckeley and Leverett treatment Reservoir, Decline curve analysis. Gas, gas-condensate and oil reserves: Identification from fluid composition, Performance of volumetric reservoir, Production characteristics.

Text Books:

1. Fundamentals of Reservoir Engineering, L.P. Dake, Elsevier Science, 1978 (17th Impression 1998).
2. B. C. Craft – M. Hawkins Applied Petroleum Reservoir Engineering, Third Edition, Revised by Ronald E. Terry & J. Brandon Rogers Prentice Hall, New York, 2014.

References:

1. Reservoir Engineering Handbook, Tarek Ahmed, 3 rd Edition, Gulf Professional Publishing, 2006.
2. Petroleum Reservoir Engineering, James W Amyx, Daniel M. Bass Jr., Robert L. Whiting, McGraw Hill, 1960.
3. Petroleum Engineering: Principles and Practice, J.S Archer & C.G. Wall, Graham &Trotman Inc. 1986.
4. Oil & Gas Field Development,Dr. Santkumar.
5. Petroleum Reservoir Engineering, James.W. Amyx

Pre Ph.D (PE)

Course Title: Non-Conventional Petroleum Resources	Course Code: MBZ650
Credit: 4	L **4** T **0** P **0**
Year: **1st**	Semester: **I/II**

UNIT – 1 10L

Introduction and present status of coal bed methane. Formation and properties of coal bed methane. Thermodynamics of coal bed methane. Drilling, completion and logging of coal bed methane wells.

UNIT – 2 8L

Hydro-fracturing of coal bed methaneseam. Production, installation and surface facilities. Well operation and production equipments. Treating and disposing produced water. Testing of coal bed methane wells.

UNIT – 3 10L

Introduction and present status of gas hydrates. Formation and properties of gas hydrates. Thermodynamics of gas hydrates. Phase behavior of gas hydrates. Kinetics of gas hydrates. Drilling and completion of gas hydrates wells. Prevention and control of gas hydrates.

UNIT – 4 6L

Gas hydrates accumulation in porous media. Gas extraction from gas hydrates. Uses and applications of gas hydrates.

UNIT – 5 8L

Introduction and present status of shale gas. Formation and properties of shale gas. Drilling and completion of shale gas. Uses and applications of shale gas. Prevention and control of shale gas. Environmental issues in shale gas exploration. Future prospects of shale gas

Books:

1. Coal Bed Reservoir Gas –in Place Analysis; Matt Mavor, Charles R. Nelson; Gas Research Institute.
2. A guide to Coal Bed Methane Reservoir Engineering; Jerrald L. Saulsberry; Paul S. Schafer; Gas Research Institute

Pre Ph.D (PE)

Course Title: Drilling Fluids and Cements			Course Code: MBZ660
Credit: 4	L **4**	T **0**	P **0**
Year: **1st**			Semester: **I/II**

UNIT – 1 8L

Types of drilling fluid: water-base and oil base, components of drilling fluid system: bentonite types and hydration characteristics; properties, sp.gr. viscosity.

UNIT – 2 6L

Fluid-loss characteristics, filtrate resistively caking characteristics.

UNIT – 3 8L

Oil-base drilling fluid system; saline mud system. Additives used to control drilling fluid system.

UNIT – 4 10L

Oil-well cements; composition, cement slurry components, setting and rheological behavior of cement slurry, strength characteristics of set cement-mass additives used to modify cement slurry characteristics.

UNIT – 5 8L

Cement-slurry preparation and down hole displacement processes and system.

Text Books:

1. Gatlin C.; Petroleum Engineering, Drilling and Well Completions, Prentice Hall.
2. Azar, J. J., G. Robello Samuel; Drilling Engineering, Penn Well.
3. Drilling Mud and Cement Slurry Rheology Manual; Gulf Publishing Company.
4. Smith.P.K"Cementing" SPE Pulications 2nd Edition 1976.

Pre Ph.D (PE)

Course Title: Oil and Gas Well Drilling	Course Code: MBZ670
Credit: 1	L **2** T **0** P **0**
Year: **1st**	Semester: **I/II**

UNIT – 1 8L

Site selection. Rig selection. Choice of drilling methods. Rotary drilling rig components. Rocks bit types and operational characteristics: Drill string components drill pipe, drill collar, Kelly.

UNIT – 2 8L

Load estimation and choice of material, joint types, casing types and scheme. Stress condition in casing string; design factors. Casing head system. Casing seat selection.

UNIT – 3 8L

Oil-well cement and casing cementation. Cement-slurry design for efficient mud displacement, Cementing quality evaluation: height of the cement, cement bonding with casing and formation.

UNIT – 4 10L

Use of logging methods for quality assessment; cement bond log. Formation isolation testing. Formation drill-ability; factor affecting; load on bit, rotational rpm; drilling fluid characteristics.

UNIT – 5 6L

Well orientation survey. Well deflection; direction determination and presentation

Books;

1. Drilling Engineering-A complete well planning approach; Neal J. Adams; PennWell publishing Company; Tulsa, Okhlama.
2. Drilling Well Completions; Carl Gatlin, PHI
3. Applied Drilling Engineering; Adam T. Bourgyne Jr., Keith K. Milheim; SPE
4. Casing design theory and practice; S.S. Rahman, G.V. Chilingarian; Elsevier

Faculty of Pharmacy
DIT University Dehradun

Course Structure & Syllabus
for
Pre Ph.D. (Pharmacy) Course Work
Session: 2015-16

Pre Ph.D (Pharmacy)

Sr. No.	Course Code	Course Title	L	T	P	Credit
1	GBG010	Research Methods	4	0	0	4
2	NHZ020	Advanced Pharmaceutics	4	0	0	4
3	NHZ030	Drug Regulatory Affairs	4	0	0	4
4	NHZ040	Targeted Drug Delivery Systems	4	0	0	4
5	LCZ110	Seminar	1	0	0	1
		Total Credits				**17**

Pre Ph.D (Pharmacy)

Course Title: **Research Methods**	Course Code: **GBG010**
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: **I/II**

UNIT 1: RESEARCH: MEANING AND SCOPE (5 Hrs)

Philosophy and Meaning of Research, Nature and Scope of Research, Nature of inquiry in Physical Science and Social Sciences, Difference between writing a popular article and research paper, Difference between writing a book and a dissertation

UNIT 2: **RESEARCH-METHODOLOGY AND APPROACHES (10 Hrs)**

Selection of Research Topic, Plan of Work, Thesis Statement and its Feasibility, Survey of different critical approaches, Selection of a particular approach, Micro and Macro analysis, The identification of the Research Problem, Problem of plagiarism, Material Collection: Primary and Secondary Sources, Reliability of Sources

UNIT 3: **PREPARATORY STEPS (7 Hrs)**

Writing the Synopsis, Literature Survey, The search for facts; the verification of facts, the analysis of evidence, trusty and causation, sources if prejudice and bias, Collection, Listing and Organization of Material, Library references; note- making, Use of Note-Cards and Reference Cards.

UNIT 4: **ESSENTIALS OF THESIS-WRITING (13 Hrs)**

Format and the Structure of a thesis, Single and Multi-Tier Division of Chapters, Writing of the Main Chapters, Preparation and Presentation of Conclusions, Foot Notes, Bibliography, Index, Quotation & Translation, Style: Paragraphing: Mechanics of Writing, The stylistics of thesis writing, Preparation of Manuscript and References, Proof reading, Documentation, Use of MLA Style Sheet

TEXT BOOK

1. The Art of Literary Research, R.D. Altick and J.J. Fenstermaker. The University of Michigan, 1963.
2. The MLA Style Sheet- recent edition.

REFERENCE BOOKS

1. The Craft of Research, Booth and Colomb. Chicago Guides to Writing, Editing, and Publishing.
2. Methodology and Methods of Linguistic Research, I.P. Ranspopov.
3. Literary Research Guide, J.L.Harner.2nd edn. New York Press, 1993.
4. Handbook of Literary Research, R.H. Miller. The Scarecrow Press, 1995.
5. G. Watson- The Literary Thesis
6. Jaeques Barzun and Henry F. Graft. The Modern Researcher, New York, Harcorurt, Brace & World, 1962.

Pre Ph.D (Pharmacy)

Course Title: **Advanced Pharmaceutics**	Course Code: **NHZ020**
Credit: 4	L **4** T **0** P **0**
Year: **1st**	Semester: **I/II**

UNIT – I

i) Basic Concepts of Solubility and Dissolution of Pharmaceutical Solids

ii) Theoretical Estimation of Solubility

iii) Thermodynamics of Solutions; Solubility by Combination of Approaches

iv) Various Techniques for Solubilization, Experimental Methods of Determination of Solubility and its Conditions

UNIT – II

i) Polymorphism and Transformation of Solids, Amorphous Drugs and Solid Dispersion; Analytical Techniques for Solid State Characterization; Salts Screening and Selection; Excipient Compatibility

ii) Theory of Diffusion and Pharmaceutical Applications

UNIT – III

Polymers, Biopolymers and its properties, characterization and its applications

UNIT – IV

i) Oral Drug Absorption, Evaluation and Prediction

ii) Biopharmaceutical and Pharmacokinetic Evaluation of Drug molecules and Dosage Form

UNIT – V

i) FDA Guidelines for Bioequivalence Study for NDDS

ii) Developing predictive in-vitro test and in-vivo Evaluation for Oral Dosage Forms, Performance and In-Vitro/In-Vivo Correlation techniques and Approaches

Books Recommended:

1. Developing Oral Solid Dosage Forms; Pharmaceutical Theory and Practice- Yihokiu, Academic Press
2. Foundation of Pharmacokinetic ACDO RESCIGNO Kulwer Academic Publishers
3. Handbook of Pharmaceutical Manufacturing Formulation (Volumes I, II, III, IV, V,VI); Sarfaraz K. Niazi, CRC Press.
4. Handbook of Stability Testing in Pharmaceutical Development, Springer Publisher, Kim Huynh-Ba
5. Handbook of Preformulation Sarfaraz K. Niazi, Informa Health Care
6. Pharmaceutical Preformulation and Formulation; Mark Gibson, HIS Health Gr
7. Pharmaceutical Product Development IVIVC, Dueshina Murthy Chilukasi Informa Health Care
8. Pharmaceutical Dissolution Testing, Jennifer Dressman, Taylor and Francis
9. Physical Pharmacy; David Attwood, PhP Pharmaceutical Press
10. Spectroscopy of Pharmaceutical Solid; Janes S Warbrick, Taylor and Francis Group
11. Pharmaceutical Excipients Characterization by IR, Raman, NMR; David Ei Bugey and W. Paul Findlay
12. Polymorphism in Pharmaceutical Solid; Harry G Brittain
13. Bioadhesive Drug Delivery: Fundamental, Novel approaches and development: Mathioneitzes
14. Drug Delivery to Oral Cavity Molecules to Market; Tapash. K. Ghosh and Willian R. Pfister

Pre Ph.D (Pharmacy)

Course Title: **Drug Regulatory Affairs**	Course Code: **NHZ030**
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: **I/II**

UNIT – I

i) Indian Patent Act

ii) Indian Patent Filing, Drafting, Writing Claims and various Forms for Filing.

UNIT – II

i) Regulatory Regulations for MHRA, USFDA, CDSCO

UNIT – III

Good Laboratory Practices (GLP), Schedule M, Inter Regulatory Prospects on Bioavailability and Bioequivalence

UNIT – IV

i) Clinical Ethical Regulatory Issues of Nanotechnology and Nanoparticles

ii) Regulatory Issues on Pharmaceutical Excipient Techniques

UNIT – V

U.S. Patent Act

Books Recommended:

1. GLP Regulations, 2nd Edition, Revised and Expanded by Sandy Weingberg.
2. GMP Practices in Pharmaceuticals, Sidney H. Willig and Janes R Stokes
3. Preparing for FDA preapproval Inspection: Martin D. Hynes
4. Drugs and Cosmetic Act (Schedule M)
5. Gennaro A.R., Remington- The science and practice of pharmacy, Lippircott, Williams & Wilkins.
6. Banker G.S., Rhodes C.T., Modern Pharmaceutics, Marcel Dekker.
7. Malik Vijay, Drug & Cosmetics Act, 1940, Eastern Book Company, Lucknow.
8. Guarino R.A., New Drug Approval Process, Marcel Dekker.
9. Sharma P.P., How to practice GMP, Vandana Prakashan, New Delhi.
10. Sharma P.P., how to practice GLP, Vandana Prakashan, New Delhi,
11. World Health Organization, quality assurance of Pharmaceuticals I & I, Pharma Book Syndicate, Hyderabad.
12. Weinlerg S., Good Laboratory Practices, Marcel Dekker.
13. The Patent Act, 1970
14. The Trade Marks Act, 1999.
15. The Copyright Act, 1958.
16. Potdar M.A., Current Good Manufacturing Practices for Pharmaceuticals, Pharma Med Press, Hyderabad.
17. Rick N.G., Drug from Discovery to Approval, Wiley Black Well.
18. Swarlerick J., Boylan J., Encyclopedia / Pharmaceutical Technology Relevant Welesites of Regulatory Anthoriter of different countries.
19. Introduction to the pharmaceutical regulatory process.Ira R. Berry

Pre Ph.D (Pharmacy)

Course Title: **Targeted Drug Delivery Systems**	Course Code: **NHZ040**
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: **I/II**

UNIT – I

An overview on DSS & Targeted DDS: Approaches, Approval, Mechanism & Research Updates

i) Drug Targeting to Brain: Concepts, Approaches, Approval, Mechanism & Research Updates

ii) Recent Brain Targeting Concept: Nose to Brain; Ear to Brain

UNIT – II

i) Cell Specific Delivery: Concepts, Various Approaches and Recent Advances

ii) Strategies for Specific Drug Targeting to Tumour Cells and Tumour Vasculature

iii) Drug Delivery Applications of Nanoparticles and Nanotoxicology

UNIT – III

i) Recent advances in Transmucosal Drug Delivery; Buccal; Soft Palatal, Trans-Labial

ii) Ocular Drug Delivery

UNIT – IV

Targeted GI Delivery and Colon Targeting Specific Drug Delivery and Trans-Ungual

UNIT – V

i) Self Emulsifying Drug Delivery System (SEDDS): Improving Absorption of poorly soluble drugs using SEDDS and Nano Self Emulsifying Drug Delivery System(NSEDDS)

ii) Case Study On:

a) Development and Evaluation of SEDDS

b) Modified Release Solid Oral Dosage Forms

Books Recommended:

1. Sterile Product facility design and Project Management; 2nd Edition, Jeffene Nodum, CRC Press
2. Modified Release Drug Delivery Techniques; Michaeal J. Rathbone (Marcel Dekker Inc.)
3. Pharmaceutical Skin Permeation Enhancement; Kenneth A. Waters and Jonathan Hadgrats
4. Physical Characterization of Pharmaceutical Solids; Harry G. Orittam
5. Pharmaceutical Experimental Design; Gareth A. Lewis.
6. Surfactants polymer in drug delivery; Martin Malmsten
7. Drug delivery Nanoparticles formulation and characterization; Yashwant Pathak, Informa Publication
8. Dermatokinetics: S.N Murthy
9. Pharmaceutical Gene Delivery System; Alian Rolland
10. Pharmaceutical Extrution technology edited by Isaach Ghebre Sellossie
11. Compliance Handbook of pharmaceuticals, medical devices and biologics. Edited by Carmen Medina
12. Liposome technology (vol 1,2,3); Gregory Gregoriadis
13. Pharmaceutical Manufacturing Encyclopedia; Marshall Sittig
14. Pharmaceutical technology controlled drug release(vol:1,2,3) M. Rubinstein
15. Prodrug topical and ocular delivery; Kenneth B.Sloan
16. Microencapsulation method and industrial application; Simon Benita
17. Oral mucosal drug delivery system. Michail,J.rathbone

Pre Ph.D (Pharmacy)

Course Title: **Seminar**			Course Code: **LCZ110**
Credit: 1	L **1**	T **0**	P **0**
Year: **1st**			Semester: **I/II**

Department of Physics
DIT University Dehradun

Course Structure & Syllabus
for
Pre Ph.D. (Physics) Course Work
Session: 2016-17

Pre Ph.D (Physics)

Sr. No.	Course Code	Course Title	L	T	P	Credit
1	GBG010	Research Methods	4	0	0	4
2	JBA010	Advanced Mathematics	4	0	0	4
3	OAZ010	Photonics Technology	4	0	0	4
4	OAZ020	Nano Scale Science and Nano Technology	4	0	0	4
5	OAZ111	Seminar	1	0	0	1
		Total Credits				**17**

Pre Ph.D (Physics)

Course Title: **Research Methods**	Course Code: GBG010
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: **I/II**

UNIT 1: RESEARCH: MEANING AND SCOPE (5 Hrs)

Philosophy and Meaning of Research, Nature and Scope of Research, Nature of inquiry in Physical Science and Social Sciences, Difference between writing a popular article and research paper, Difference between writing a book and a dissertation

UNIT 2: **RESEARCH-METHODOLOGY AND APPROACHES (10 Hrs)**

Selection of Research Topic, Plan of Work, Thesis Statement and its Feasibility, Survey of different critical approaches, Selection of a particular approach, Micro and Macro analysis, The identification of the Research Problem, Problem of plagiarism, Material Collection: Primary and Secondary Sources, Reliability of Sources

UNIT 3: **PREPARATORY STEPS (7 Hrs)**

Writing the Synopsis, Literature Survey, The search for facts; the verification of facts, the analysis of evidence, trusty and causation, sources if prejudice and bias, Collection, Listing and Organization of Material, Library references; note- making, Use of Note-Cards and Reference Cards.

UNIT 4: **ESSENTIALS OF THESIS-WRITING (13 Hrs)**

Format and the Structure of a thesis, Single and Multi-Tier Division of Chapters, Writing of the Main Chapters, Preparation and Presentation of Conclusions, Foot Notes, Bibliography, Index, Quotation & Translation, Style: Paragraphing: Mechanics of Writing, The stylistics of thesis writing, Preparation of Manuscript and References, Proof reading, Documentation, Use of MLA Style Sheet

TEXT BOOK

1. The Art of Literary Research, R.D. Altick and J.J. Fenstermaker. The University of Michigan, 1963.
2. The MLA Style Sheet- recent edition.

REFERENCE BOOKS

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2. Methodology and Methods of Linguistic Research, I.P. Ranspopov.
3. Literary Research Guide, J.L.Harner.2nd edn. New York Press, 1993.
4. Handbook of Literary Research, R.H. Miller. The Scarecrow Press, 1995.
5. G. Watson- The Literary Thesis
6. Jaeques Barzun and Henry F. Graft. The Modern Researcher, New York, Harcorurt, Brace & World, 1962.

Pre Ph.D (Physics)

Course Title: **Advanced Mathematics**	Course Code: JBA010
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: **I/II**

Numerical Techniques
Zeros of Transcendental and Polynomial equation using bisection method, Newton-Raphson method, Rate of convergence of above methods. Interpolation: Finite differences, difference tables, Newton's Forward and Newton's Backward Interpolation, Lagrange's and Newton divided difference formula for unequal intervals. Solution of system of Linear equations, Gauss-Seidal method, Crout method. Numerical Integration: Trapezoidal rule, Simpson's one-third rule, Simpson's three-eighth rule, Solution of ordinary differential (first order, second order and simultaneous) equations by Picard's and Fourth order Runga - Kutta methods

Partial Differential Equations (PDE)
Formation and Classification of PDE, Solution of One Dimension Wave Equation, and Heat Equation, Two Dimension Heat and Laplace Equation by Separation of variables Method.

Special Functions
Series solution of ODE of 2nd order with variable coefficient with special emphasis to Legendre and Bessel differential equation, Legendre polynomial of first kind, Bessel Function of first kind and their properties.

Statistics:
Elements of statistics, frequency distribution: concept of mean , median, mode, Standard derivation , variance and different types of distribution: Binomial, Poisson and Normal distribution, curve fitting by least square method, Correlation and Regression, Concept of Hypothesis Testing.

Optimization:
Formulation, Graphical method, Simplex method, Two-Phase simplex method, Duality, Primaldual relationship, Dual-simplex method.

Text Books:

- R. K. Jain & S. R. K. Iyenger: Advanced Engineering Mathematics, Narosa publication, 2014.
- Jain, Iyenger & Jain: Numerical methods for scientific & Engg. Computation, New age, 2003.
- Gupta S. C., Kapoor V. K.: Fundamentals of Statistics, Sultan Chand & Sons, Eleventh Edition (Reprint) 2014.

Reference Books:

- E. Kreyszig: Advanced Engineering Mathematics, Wiley publication.
- B.S. Grewal: Higher Engineering Mathematics, 42nd Edition, Khanna Publication, India, 2012.

Pre Ph.D (Physics)

Course Title: **Photonics Technology**	Course Code: OAZ010
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: **I/II**

Unit I: Integrated Optics

Step-index and graded-index waveguides, guided and radiation modes. Strip and channel waveguides, electro-optic and acoustooptic waveguide devices. Directional couplers, optical switch; phase and amplitude modulators, filters, etc. Y-junction, power splitters, Arrayed waveguide devices, fiber pigtailing, Fabrication of integrated optical waveguides and devices. Waveguide characterisation, end-fire and prism coupling; grating and tapered couplers, nonlinear effects in integrated optical waveguides.

Unit II: Fiber Optics

Introduction, The optical fiber, The numerical aperture, Step and graded index multimode fibers, Pulse dispersion in step index fibers, Scalar wave equation and modes of a fiber, Modal analysis of parabolic index medium, Multimode fibers, Single mode fibers, Gaussian Approximation, Splice loss etc.

Unit III: Nonlinear Optics

Introduction, Self focusing phenomenon, simple SHG, Nonlinear frequency upconversion, Single-pass SHG and SFG, Resonator-enhanced SHG, parametric amplification and SFG, Intracavity SHG and SFG, Guided-wave SHG etc.

Unit IV: Fabrication of Photonic Devices

Material selection for various applications, Fabrication techniques for various kinds of Photonic structures, such as Waveguide structures, Nonlinear Optical structures and Microstructures

Recommended Books:

- Ajoy Ghatak &, K. Thyagarajan, "Optical Electronics", Cambridge University Press
- A.K.Ghatak & K.Thyagarajan, "Introduction to Fiber Optics", Cambridge University Press.
- M. J. Adams, "An Introduction to Optical Wave guides", John Wiley & Sons.
- Hiroshi Nishihara, Masamitsu Haruna, "Optical Integrated Circuits", McGraw Hill Professional.
- William P Risk, Timothy R. Gishell, "Compact Blue-Green Lasers", Cambridge Univ. Press.
- Saleh & Tiech, "Fundamentals Of Photonics", (2012), John Wiley, New York.

Pre Ph.D (Physics)

Course Title: Nano Scale Science and Nano Technology	Course Code: OAZ020
Credit: 4	L: **4** T: **0** P: **0**
Year: **1st**	Semester: **I/II**

UNIT 1

Historical perspective of nano science and technology, types of nanotechnology and Nano machines, top-down and bottom-up techniques, molecular nanotechnology, atomic manipulations – nano dots, self-assembly, dip pen nanolithography, simple details of characterization tools – SEM, TEM, STM, AFM.

UNIT 2

Nano materials: preparation of nano-materials, PVD, CVD, sol-gel techniques, electro deposition, ball milling, natural nano-materials, application of nanomaterials – insulating materials, machine tools, polymers, batteries, high power magnets and medical implants.

UNIT 3

New form of carbon, carbon nanotubes, single walled carbon nanotubes (SWNTs), multiple walled carbon nanotubes (MWNTs), graphenes, fullerenes, nano wires and nano rods (fabrication methods and their applications).

UNIT 4

Nanophotonics and solar energy: Metamaterials & Plasmonics, Photonic crystals, Silicon photonics and Photovoltiacs.

UNIT 5

Nanofabrication: Introduction, tools of micro and nano fabrication, optical and electron beam lithography, molecular beam lithography, quantum electronic devices, simple ideas about Nano computers.

Applications: Micro Electro Mechanical system (MEM), Nano Electro Mechanical system (NEM), Robots, Nanomachines.

References

1. Introduction to nanotechnology, Charles P. Poole Jr. and Frank J. Owens, Wiley Intersciences, 2003
2. Nanotechnology: Basic Science and Emerging Technologies, Mick Wilson, Kamali Kannagara, Geoff Smith, Overseas Press, 2005
3. Nanotechnology – A Gentle Introduction to the Next Big Idea, Mark Ratner and Daniel Ratner, Prentice Hall, 2002
4. Nano : The Essentials, Understanding of Nanoscience and Nanotechnology, T. Pradeep, Tata McGraw Hill, 2007
5. Nanotechnology, Jeremy Ramsden, Ventus Publishing ApS (download from http//bookboon.com/us/student/chemistry)
6. Nanotechnology: Concepts, Application and Perspectives, C.M. Niemeyer and C.A. Mirkin, Wiley-VCH, 2004
7. Physics of Semiconductor Nano Structures, K.P. Jain, Narosa Publishers, 1997
8. Nanotechnology : Technology Revolution of 21st Century, Rakesh Rathi, S.Chand, 2009

Pre Ph.D (Physics)

Course Title: **Seminar**			Course Code: OAZ111
Credit: 1	L **2**	T **0**	P **0**
Year: **1st**			Semester: **I/II**