Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23

DIT UNIVERSITY
Dehradun

Detailed Course Structure & Syllabus of B.Tech – CSE (with Specialization in ML)

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
# Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23

**Year: 1st  Semester: I**

<table>
<thead>
<tr>
<th>Course Category</th>
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**Total** 18.5

**Year: 1st  Semester: II**

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**Total** 19

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### Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)

**Applicable for Batch: 2019-23**

**Year: 2\(^{nd}\) Semester: III**

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**Total** 24

**Year: 2\(^{nd}\) Semester: IV**

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**Total** 22

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## Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)

**Applicable for Batch: 2019-23**

**Year:** 3<sup>rd</sup>  
**Semester:** V

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**Total** 23

### Department Elective 1

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<td>HS385</td>
<td>Engineering Economics</td>
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<tr>
<td>HS391</td>
<td>Positive Psychology &amp; Living</td>
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<tr>
<td>HS382</td>
<td>Literature, Language and Society</td>
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**Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019**
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23

Year: 3rd
Semester: VI

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<td>CS347</td>
<td>Digital Image Processing</td>
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<td>Data Mining and data Warehousing</td>
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<td>CS353</td>
<td>Grid Computing</td>
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# Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)

**Applicable for Batch: 2019-23**

**Year: 4\(^{th}\)  
**Semester: VII**

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# Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)

**Applicable for Batch: 2019-23**

**Year: 4th**  
**Semester: VIII**

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**Total** 17

**Department Elective 7**

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<tr>
<td>CS441</td>
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<td>CS442</td>
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**Department Elective 8**

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<td>CS472</td>
<td>Information Security</td>
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<tr>
<td>CS473</td>
<td>Computer Vision</td>
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<td>CS457</td>
<td>Soft Computing</td>
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**Department Elective 9**

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<tbody>
<tr>
<td>CS471</td>
<td>Data Base Administration</td>
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<tr>
<td>CS443</td>
<td>LAMP Technology</td>
</tr>
<tr>
<td>CS474</td>
<td>Object Oriented Modelling &amp; Design</td>
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**Department Elective 10**

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<tr>
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<tbody>
<tr>
<td>CS456</td>
<td>Business Intelligence</td>
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<td>CS458</td>
<td>Mobile Computing</td>
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<td>CS459</td>
<td>IOT Concepts</td>
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**Humanities Elective 4**

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<td>HS493</td>
<td>Indian Culture &amp; Tradition</td>
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<tr>
<td>HS483</td>
<td>Indian Philosophy</td>
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<tr>
<td>HS491</td>
<td>Industrial Sociology</td>
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<tr>
<td>HS485</td>
<td>Sustainable Development</td>
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Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)  
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Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019

### Open Elective - 2

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<thead>
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### Summary of the Credit

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Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
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<table>
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<tr>
<th>Subject Code</th>
<th>Subject Title</th>
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<td>HS103</td>
<td>Professional Communication</td>
<td>UC</td>
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**Course Outline:**

**Course Objective:**
To develop the LSRW skills of students for effective communication, to equip the students for business environment, to prepare the students understand and present themselves effectively

**Course Pre/Co-requisite (if any):**

**UNIT 1: Communication**

**UNIT 2: Listening & Speaking Skills**
Listening Comprehension: identifying General and Specific information, Note taking and drawing inferences. Introduction to Phonetics: Articulation of consonants and vowel sounds.

**UNIT 3: Reading Skills & Technical Writing Skills**

**UNIT 4: Business Letter Writing**
Business Letter Writing, Job Application Letter & Resume, Interview Skills, Impression Management, Swot Analysis (Identifying Strength & Weakness), EQ and Its Dimensions

**Learning Outcome**
At the end of the course, the student will be able to:
CO1. Communicate smoothly
CO2. Write formal documents
CO3. Present themselves effectively

**Text book [TB]:**

**Reference Books [RB]:**

**List of Experiments:**
1. Neutralization of Mother Tongue Influence through manner of articulation, Introduction to Speech Sounds – Practicing Vowel and Consonant sounds
2. Listening (Biographies through software) & Presentation of Biographies
3. Listening & Role Play on Situational/ Telephonic Conversation (through software)
4. Picture presentation
5. Public Speaking
6. Group Discussion
7. Case Studies
8. SWOT analysis
9. Interview
10. Final evaluation

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
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<table>
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<tr>
<th>Subject Code</th>
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Course Outline:

Course Objective:

To introduce the fundamentals in Differential, Integral and Vector Calculus, use of tools for solving engineering problems.

Course Pre/Co- requisite (if any):

UNIT 1: Limit, Continuity and Differentiability
Review of Limit, Continuity and Differentiability; Indeterminate forms, L’ Hospital’s rule, Rolle’s Theorem, Mean Value theorem and its applications, Successive Differentiation, Leibnitz’s Theorem, Taylor’s and Maclaurin’s Series, Maxima and Minima, Asymptotes, Curvature, Evolutes, Involutes, Sketching of curves.

UNIT 2: Multivariable calculus (Differentiation)
Limit, Continuity, Partial Derivatives, Euler’s Theorem, Total Derivatives, Taylor’s series, Maxima and Minima, Method of Lagrange’s multipliers.

UNIT 3: Multiple Integral
Review of indefinite and definite integrals and its application to evaluate surface area and volume of revolutions, Beta and Gamma functions and their properties, Double integral, Change of order of integration, Change of variables, triple integral, Dirichlet’s integral and their applications.

UNIT 4: Vector Calculus

Learning Outcome

At the end of the course, the student will be able to:
CO1. Learn techniques in calculus, multivariate analysis and linear algebra.
CO2. Equip the students with standard concepts and tools for tackling advanced level of mathematics and applications.
CO3. Familiarity with fundamental tools of Differential, Integral and Vector Calculus.

Text book [TB]:


Reference Books [RB]:

Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)

Applicable for Batch: 2019-23

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Title</th>
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<td>EE103</td>
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**Subject Code** | **EE103** | **Subject Title** | **Basic Electrical Engineering** |

**LTP** | 3-1-2 | **Credit** | 5 | **Subject Category** | UC | **Year** | 1st | **Semester** | I / II |

**Course Outline:**

**Course Objective:**

- To apprise students about electric charge, current, voltage and various circuit laws involved in analysis.
- To get acquainted with the basic idea of Generation, Transmission and Distribution of Electrical energy.
- To provide the basic knowledge of operation and working of different types of electrical equipment and their applications.

**Course Pre/co-requisite (if any):**

**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**
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 3 wire system.
Measuring Instruments: Construction and principle of voltage and current measuring instruments.

**UNIT 3: Power System & Transformers**
Single line diagram of simple power system.

**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, 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

**Learning Outcome**
At the end of the course, the student will be able to:
CO1. Students will be familiar about electrical charge, current, voltage and various basic electric circuit laws.
CO2. Acquaint students about DC circuit analysis and methods.
CO3. Advanced approach for solving series parallel network of resistors by star delta transformation.
CO4. Acknowledge students with the use of transformers and its working.
CO5. To build an ability amongst students regarding the functioning of DC machines and its characteristics.
CO6. Students will recognize the need for synchronous machine in our electrical systems, its basic functioning and various advantages over other types of machines.

**Text book [TB]:**

**Reference Books [RB]:**

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
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List of Experiments:
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.
5. Determination of parameters and losses in a single phase transformer by OC and SC test.
7. Study of characteristic of AC Motor.
8. DC generator characteristics.
9. 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.
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
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<table>
<thead>
<tr>
<th>Subject Code</th>
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<tr>
<td>PY102</td>
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<td>UC</td>
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<tr>
<td>3-1-2</td>
<td>5</td>
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**Course Outline:**
This course starts with the basic concepts of work, energy and collisions between particles. The course then covers the angular motion of bodies and moment of inertia, elasticity, fluid motion, laws of gravitation.

**Course Objective:**
Mechanics lies at the foundation of physics and along with an appreciation of the molecular structure of matter exposes the student to the phenomenology of physics.

**Course Pre/Co-requisite (if any):**

**Detailed Syllabus**

**UNIT 1**
Transformation of scalars and vectors under Rotation transformation; Newton’s laws and its completeness in describing particle motion, Cylindrical and spherical coordinates
Mechanics of a system of particles, conservation of laws of linear momentum, angular momentum and mechanical energy, centre of mass and equation of motion, Constraints and degrees of freedom.

**UNIT 2**
Potential energy function; F = - Grad V, Equipotential surfaces and meaning of gradient; Conservative and non-conservative forces, curl of a force field; Central forces; Conservation of Angular Momentum and areal velocity; Elliptical, parabolic and hyperbolic orbits

**UNIT 3**
Non-inertial frames of reference; Rotating frames of reference, Coriolis force; Applications: Weather systems, projectile motion

**UNIT 4**
Harmonic oscillator; Damped harmonic motion – over-damped, critically damped and lightly-damped oscillators; Forced oscillations and resonance, Kater’s Pendulum and bar pendulum

**UNIT 5**
Rotation of rigid body, Moment of Inertia, Torque, angular momentum, kinetic energy of rotation, Theorems of perpendicular and parallel axis, Moment of Inertia of rectangular rod, spherical and cylindrical bodies. Acceleration of a body moving on horizontal and inclined plane. Moment of inertia of Fly Wheel.

**UNIT 6**
Elastic constants- Introduction and relationship between elastic constants, Cantilever, Beam, Bending of beam, Twisting of a cylindrical body.

**Learning Outcome**

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
At the end of the course, the student can:

CO1. To know Newton’s laws of motion, potentials, conservation of energy, momentum and angular momentum, and be able to apply them to projectiles, circular motion, and gravity

CO2. Demonstrate an understanding of intermediate mechanics topics such as co-ordinate transformations, oscillatory motion, gravitation etc.

CO3. Demonstrate rigid body and rotational dynamics using the concept of angular velocity and momentum.

CO4. Understand the concept of non-inertial frames of reference, coriolis and centripetal accelerations and their applications.

Textbook [TB]:

Reference books [RB]:
2. Introduction to Special Relativity, R. Resnick, John Wiley and Sons, 2007

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<tr>
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<th>LIST OF EXPERIMENTS</th>
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<tr>
<td>1</td>
<td>To measure internal diameter, external diameter and depth of a vessel using vernier calipers</td>
</tr>
<tr>
<td>2</td>
<td>To measure density of a wire using screw gauge.</td>
</tr>
<tr>
<td>3</td>
<td>To determine the Moment of Inertia of a Flywheel</td>
</tr>
<tr>
<td>4</td>
<td>To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille’s method)</td>
</tr>
<tr>
<td>5</td>
<td>To determine the Modulus of Rigidity of a Wire by Maxwell’s needle</td>
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<tr>
<td>6</td>
<td>To determine the elastic Constants of a wire by Searle’s method</td>
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<tr>
<td>7</td>
<td>To determine the value of g using Bar Pendulum</td>
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<tr>
<td>8</td>
<td>To measure the Young’s Modulus using Bending of Beam</td>
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<tr>
<td>9</td>
<td>To determine the value of g using Kater’s Pendulum</td>
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<tr>
<td>10</td>
<td>To determine the moment of inertia of a body using Torsion pendulum</td>
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</table>
Course Outline:
This course develops a strong background of simple harmonic motion, their superposition, wave motion, interference and diffraction, lasers, semiconductors, and introduction to quantum mechanics.

Course Objective:
The objective of this course is to develop a fundamental basis of waves, optical phenomenon, concepts of quantum mechanics and semiconductor physics which the engineering students can apply to their respective area of specialization.

Course Pre/Co- requisite (if any): no pre-requisite

Detailed Syllabus
Unit 1: Waves
Mechanical and electrical simple harmonic oscillators (characteristics and energy), damped harmonic oscillator, forced mechanical and electrical oscillators, impedance.

Unit 2: Non-dispersive transverse and longitudinal waves
Transverse wave on a string, the wave equation on a string, harmonic waves, reflection and transmission of waves at a boundary, standing waves and their eigen frequencies, longitudinal waves and the wave equation for them, acoustics waves (Newton formula and Laplace correction).

Unit-3: Wave Optics
Huygens’ principle, superposition of waves and interference of light by wave front splitting and amplitude splitting; Young’s double slit experiment, fringes with white light, interference in parallel thin films, Newton’s rings, Fraunhofer diffraction from a single slit & N- slits, Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power.

Unit- 4: Lasers
Einstein’s theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, components of LASER and pumping methods (in brief), different types of lasers: gas lasers (He-Ne), solid-state laser (ruby)

Unit- 5: Introduction to Quantum Mechanics
Wave nature of particles, Phase velocity, wave-packet and group velocity, Uncertainty principle and its applications, time-dependent and time-independent Schrodinger equation, physical significance of wave function, Solution of stationary-state Schrodinger equation for one dimensional problem–particle in a box,potential barrier.

Learning Outcome
At the end of the course, the student will be able to:

CO1. To acquire skills allowing the student to identify and apply formulas of optics and wave physics using course literature.

CO2. To be able to identify and illustrate physical concepts and terminology used in optics and to be able to explain them in appropriate detail.

CO3. To be able to make approximate judgments about optical and other wave phenomena when necessary.
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CO4. To acquire skills allowing the student to organize and plan simpler laboratory course experiments and to prepare an associated oral and written report.
CO5. To have basic knowledge of Quantum Mechanics and Semiconductors.

Text book [TB]:

Reference books [RB]:

<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>LIST OF EXPERIMENTS</th>
</tr>
</thead>
</table>
| 1     | (a) To determine wavelength of sodium light using Newton’s Rings.  
       | (b) To determine the refractive index of a liquid using Newton’s Rings. |
| 2     | To determine wavelength of sodium light using Fresnel’s Biprism. |
| 3     | (a) To determine wavelength of prominent lines of mercury using plane diffraction grating.  
       | (b) To determine the dispersive power of a plane transmission diffraction grating. |
| 4     | To determine the specific rotation of cane sugar solution using bi-quartz polarimeter |
| 5     | To study the diffraction pattern of Single slit and hence determine the slit width. |
| 6     | (a) To verify cosine square law (Malus Law) for plane polarized light.  
       | (b) To study the nature of polarization using a quarter wave plate. |
| 7     | To study the variation of refractive index of the material of the prism with wavelength and to verify Cauchy’s dispersion formula |
| 8     | (a) To study photoelectric effect and determine the value of Planck’s constant.  
       | (b) To verify inverse square law using photocell. |
| 9     | To determine the frequency of AC mains using sonometer. |
| 10    | To determine the frequency of AC mains or of an electric vibrator by Melde’s experiment |
| 11    | To measure the numerical aperture (NA) of an optical fiber. |

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<table>
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<th>Subject Title</th>
<th>Introduction to Electromagnetic Theory</th>
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<tr>
<td>PY104</td>
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<td>LTP 3-1-2 Credit 5 Subject Category UC Year 1st Semester 1/II</td>
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Course Outline:
The course develops a strong base on electrostatics and magnetostatics, Faraday’s Laws, Displacement current, Electromagnetic waves.

Course Objective:
To teach students the effects of electric charges at rest and in motion. Both positive and negative charges produce force field which is called “electric field”. Moving charges produce current, which gives rise to another force field called “magnetic field”. The electromagnetic theory studies the behavior of the electric and magnetic fields.

Course Pre/Co-requisite (if any): no pre-requisite

Detailed Syllabus
Unit 1: Electrostatics in vacuum
Calculation of electric field and electrostatic potential for a charge distribution; Divergence and curl of electrostatic field; Gauss law and its applications, Laplace’s and Poisson’s equations; Practical examples like Faraday’s cage and coffee-ring effect; energy of a charge distribution and its expression in terms of electric field.

Unit 2: Electrostatics in a linear dielectric medium
Electrostatic field and potential of a dipole. Bound charges due to electric polarization; Electric displacement; gauss law in dielectrics; Polarization vector, solving simple electrostatics problems in presence of dielectrics – Point charge at the centre of a dielectric sphere, charge in front of a dielectric slab, dielectric slab and dielectric sphere in uniform electric field. Energy in dielectrics system

Unit 3: Magnetostatics
Electric current and current density, magnetic force, continuity equation, Bio-Savart law and its applications(straight wire and solenoid), Divergence and curl of static magnetic field; Ampere circuital law and its applications( wire, solenoid & toroid), current loop as magnetic dipole and dipole moment, Para, dia and ferro magnetic materials (properties only)

Unit-4: Faraday’s law
Faraday’s law in terms of EMF produced by changing magnetic flux; equivalence of Faraday’s law and motional EMF; Lenz’s law; Electromagnetic breaking and its applications; Differential form of Faraday’s law expressing curl of electric field in terms of time-derivative of magnetic field and calculating electric field due to changing magnetic fields in quasi-static approximation; energy stored in a magnetic field.

Unit-5: Displacement current, Magnetic field due to time-dependent electric field and Maxwell’s equations
Concept of displace current, Modifying equation for the curl of magnetic field to satisfy continuity equation; and magnetic field arising from time-dependent electric field; Maxwell’s equation in integral and differential form in vacuum and non-conducting medium; transverse nature of EM wave, Wave equation in free space, Wave propagation in conducting medium and non-conducting medium & skin depth, Flow of energy and Poynting vector.

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
Learning Outcome

Having successfully completed this course, the student will be able to demonstrate knowledge and understanding of:

CO1. The use of Coulomb’s law and Gauss’ law for the electrostatic force
CO2. The relationship between electrostatic field and electrostatic potential
CO3. The use of the Lorentz force law for the magnetic force
CO4. The use of Ampere’s law to calculate magnetic fields
CO5. The use of Faraday’s law in induction problems
CO6. The basic laws that underlie the properties of electric circuit elements

Text book [TB]:
1. Introduction to Electrodynamics, David Griffiths, PHI Learning, 2012.

Reference books [RB]:

<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>LIST OF EXPERIMENTS (ANY TEN)</th>
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<tbody>
<tr>
<td>1</td>
<td>Identification of various electronic components.</td>
</tr>
<tr>
<td>2</td>
<td>Use of multimeter for testing diodes, LEDs, transistors and measurements of resistance, capacitance, inductance, dc voltage, ac voltage, ac current and frequency of ac mains.</td>
</tr>
<tr>
<td>3</td>
<td>Charging and discharging of capacitor through resistance and determination of time constant.</td>
</tr>
<tr>
<td>4</td>
<td>To determine the specific resistance of a given wire using Carey Foster’s bridge.</td>
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<tr>
<td>5</td>
<td>To verify Stefan’s law by electrical method.</td>
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<tr>
<td>6</td>
<td>To study the variation of magnetic field with distance along the axis of a current carrying coil and determination of radius of the coil.</td>
</tr>
<tr>
<td>7</td>
<td>To calibrate the given volt meter using potentiometer.</td>
</tr>
<tr>
<td>8</td>
<td>To calibrate the given ammeter using potentiometer.</td>
</tr>
<tr>
<td>9</td>
<td>To determine the band gap of a semiconductor p-n junction.</td>
</tr>
<tr>
<td>10</td>
<td>To determine the resistance of a sample using four probe method.</td>
</tr>
<tr>
<td>11</td>
<td>To determine the band gap of semiconductor using four probe method.</td>
</tr>
<tr>
<td>12</td>
<td>To determine a unknown resistance using Wheatstone bridge.</td>
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Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML) 
Applicable for Batch: 2019-23

<table>
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<th>Subject Code</th>
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Course Outline:

Course Objective:
The objectives of this course are to enable students to acquire and use engineering graphics skills as a means of accurately and clearly communicating ideas, information and instructions for technical communication.

Course Pre/Co-requisite (if any):

Detailed Syllabus

UNIT 1: Introduction to Engineering Graphics
Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, involutes; Scales Plain, Diagonal

UNIT 2: Projection of Points and Planes
Orthographic Projections covering, Principles of Orthographic Projections, Projections of Points and lines inclined to both planes; Projections of planes inclined Planes

UNIT 3: Projection of Solids
Projections of solids in simple position, projections of solids with axes inclined to one reference plane and parallel to other. Projections of solids with axes inclined to both of the reference plane

UNIT 4: Section of Solids and Development of Surfaces
Sections and Sectional Views of Right Angular Solids covering, Prism, Cylinder, Pyramid, Cone, Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone

UNIT 5: Isometric Projection and Auto CAD
Isometric Projections, Freehand Sketching, Simple and compound Solids, Conversion of Isometric Views to Orthographic Views (simple machine components according to first angle projection method), Basic AutoCAD commands & its applications

Learning Outcome
At the end of the course, the student will be able to:

CO1: Be able to use Engineering Drawing Skills as a means of accurately and clearly communicating ideas, information and instructions.

CO2: Acquire requisite knowledge, techniques and attitude for advanced study of engineering drawing.

CO3: Comprehend and draw a simple engineering drawing primarily in first angle Orthographic projections.

CO4: To create section views of simple engineering objects

CO5: To understand basic AutoCAD commands and appreciate the need of AutoCAD over Manual Drafting.

Text book [TB]:

Reference Books [RB]:
5. (Corresponding set of) CAD Software Theory and User Manuals

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)  
Applicable for Batch: 2019-23

<table>
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Course Outline:

Course Objective:

The objective of the course is to introduce the fundamentals in Matrices and Linear Algebra, Solving Ordinary Differential Equations, Convergence of an Infinite Series, Laplace Transform and Fourier Series relevant to engineering applications.

Course Pre/Co-requisite (if any):

UNIT 1: Linear Algebra

UNIT 2: Differential Equations
Methods of solving differential equations of first order and first degree, Bernoulli equation, Wronskian, Solutions of linear differential equations of higher order with constant coefficients, Cauchy-Euler linear differential equation, Solution of second order linear differential equation with variable coefficients, Method of variation of parameters. Solution of simultaneous linear differential equations of first order.

UNIT 3: Infinite Series
Introduction to sequences and series, Convergence and divergence, Series of positive terms, Comparison test, Cauchy’s integral test, D’Alembert’s ratio test, Cauchy’s root test, Raabe’s test, Logarithmic test, Alternating series, Leibnitz test.

UNIT 4: 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 5: Laplace Transform

Learning Outcome

At the end of the course, the student will be able to:
CO1. Equip the students to deal with advanced level of mathematics and applications.
CO2. Familiarity with fundamental tools of Matrices and Linear Algebra, Ordinary Differential Equations, Infinite Series, Laplace Transforms and Fourier Series.
CO3. Use of tools to solve engineering applications.

Text book [TB]:

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23

Reference Books [RB]:
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23

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**Course Outline:**

**Course Objective:**
The objectives of this course are to provide a summary on water chemistry, water treatment, green chemistry and synthetic chemistry. The course intends to provide an overview of the working principles, mechanism of reactions and application of the building blocks like batteries, fuel cells, polymers and an overview of surface coatings in order to protect the metal.

**Course Pre/Co-requisite (if any):**

**UNIT 1: Water Treatment and Analysis**

**UNIT 2: Electrochemistry & Corrosion**
Electrochemical cell, Electrode potential & EMF of a Galvanic cell, Nernst Equation, Migration of ions, Transport number, Determination of Transport number by Hittorf’s method, Conductometric titrations, Types of electrode: Calomel and glass electrode, Liquid junction potential.
Corrosion and its economic aspects, Types of corrosion: Galvanic, Erosion, Crevice, Pitting, Waterline, Soil, Microbiological. Theories of corrosion: Acid, Direct Chemical attack, Electrochemical. Corrosion prevention by metallic, organic/inorganic coatings and corrosion inibitors

**UNIT 3: Polymers & Biomolecules**
Introduction; Classification of Polymers; Functionality; Mechanism of Polymerization; Plastics; Individual Polymers; LDPE, HDPE, PVC, Polystyrene, Bakelite, Teflon, PMMA, PET, Nylon-6, Rubbers (BUNA-S and BUNA-N); Specialty Polymers (Conducting Polymers, Silicones and Polycarbonates), Structural and functional attributes of cell and cell organelles; Biomolecules (Proteins, Carbohydrates, Lipids, Enzymes, Nucleic acids)

**UNIT 4: Fuels, Battery & Lubrication**
Classification of fuels, Calorific value, Cetane number, Octane number, Comparison of solid, liquid and gaseous fuel, properties of fuel, Biofuels, Power alcohol and synthetic petrol, Battery, Metal-air battery, Lithium and nickel battery. Introduction of Lubricants, Functions of Lubricants, Classification of lubricants, Mechanisms of Lubrication, Properties of Lubricants.

**UNIT 5: Green Chemistry & Nano Chemistry**
Emergence of green chemistry, Twelve principle of green chemistry, use of alternative feedstock (biofuels), Use of innocuous reagents, use of alternative solvents, design of safer chemicals, designing alternative reaction methodology, minimizing energy consumption. Introduction to Nano chemistry, properties of Nano materials, preparation of nanomaterial, self-assembly, Different Nano materials, Applications of Nano materials

**Learning Outcome**
At the end of the course, the student will be able to:
CO1: To understand about the treatment of water, sewage water and hardness related calculation
CO2: An overview of surface coatings in order to protect the metal.
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23

CO3: An ability to identify and formulate polymers and have a knowledge of various polymers like polythene, PVC, PS, Teflon, Bakelite, Nylon which have engineering applications. To gain acquaintance regarding biomolecules and their application in Engineering. To gain acquaintance regarding biomolecules and their application in engineering.

CO4: An overview of the working principles, mechanism of reactions and application of the building blocks like batteries, fuel cells,

CO5: An ability to handle various instruments like spectroscope, flame photometer etc. Have a knowledge of synthesizing Nano materials and their applications in industry. Know the properties of Fuels and Lubricants. Have a scope in the area of Material Chemistry.

Text book [TB]:

Reference books [RB]:

List of Experiments:
1. Determination of alkalinity in the given water sample.
2. Estimation of temporary and permanent hardness in water sample using EDTA as standard solution.
3. To determine the percentage of available chlorine in bleaching powder.
4. To determine the chloride content in the given water sample by Mohr’s method
5. Determination of iron content in the given ore by using External indicator
6. To determine the Dissolved Oxygen in a given water sample.
7. To determine the strength of unknown acid pH-metrically
8. To analyze the coal sample by proximate analysis.
9. To determine the Flash and Fire point of a fuel sample.
10. To determine the Viscosity of a lubricant by redwood viscometer.
11. To determine the rate constant and order of reaction
12. To determine the strength of a given solution conductometrically

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML) 
Applicable for Batch: 2019-23

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Course Outline:

Course Objective:

The objectives of this course is to learn basics concepts of engineering mechanics and increase the ability to solve problems involving forces, loads and moments and to know their applications in allied subjects

Course Pre/Co-requisite (if any):

Detailed Syllabus

UNIT 1: Introduction to Engineering Mechanics
Basic idealizations - Particle, Continuum and Rigid body; Newton's laws of Force and its characteristics, types of forces-Gravity, Lateral and its distribution on surfaces, Classification of force systems, Principle of physical independence, superposition, transmissibility of forces, Introduction to SI units.
Couple, Moment of a couple Characteristics of couple, Moment of a force, Equivalent force - couple system; Numerical problems on moment of forces and couples, on equivalent force - couple system.

UNIT 2: Equilibrium of forces
Equilibrium of forces - Definition of Equilibrant; Conditions of static equilibrium for different force systems, Lami’s theorem; Numerical problems on equilibrium of coplanar – concurrent and non-concurrent force systems Application- Static Friction in rigid bodies in contact, Types of friction, Laws of static friction, Limiting friction, Angle of friction, angle of repose; Impending motion on horizontal and inclined planes; Numerical Problems on single and two blocks on inclined planes, ladder and wedge friction.

UNIT 3: Analysis of Plane truss and Beam
Support Reaction in beams: Types of beams, Types of Loads and Supports, statically determinate beams, Numerical problems on support reactions for statically determinate beams with Point load (Normal and inclined) and uniformly distributed and uniformly varying loads and Moments.
Plane Truss: Perfect and imperfect truss Assumptions and Analysis of Plane Truss by Method of joints and Method of section.

UNIT 4: Center of Gravity and Centroids
Introduction to the concept, Centroids of line and area, Centroids of basic geometrical figures, computing Centroids for– T, L, I, and full/quadrant circular sections.

UNIT 5: Kinetics of Particle
Newton’s law of motion; Motion of bodies in Rectangular coordinates; D’Alembert’s Principle.

Learning Outcome

At the end of the course, the student will be able to:
CO1. Identify principles of mechanics to be used for solving real life engineering problems.
CO2. Apply basic Engineering concepts based on force, shape and dimension for selection of material
CO3. Comprehend the action of Forces, Moments and other loads on systems of rigid bodies.
CO4. Compute the reactive forces and the effects that develop as a result of the external loads.
CO5. Express the relationship between the motions of bodies.

Text book [TB]:

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23

Reference Books [RB]:
1. Hibler and Gupta (2010), Engineering Mechanics (Statics, Dynamics) by Pearson Education

List of Experiments:
1. Study of different types of beam.
2. Calculation and Verification of forces in truss elements.
3. Calculation and verification of equilibrium condition on beam model.
4. Calculation to find the redundant force in a truss.
5. Mechanical advantage over pulley arrangement.
6. Determining the coefficient of friction.
7. Optional Tensile Strength
8. Optional Hardness Measurement
Course Outline:

Course Objective:
Ability to prepare simple objects using machines and machine tools to make students aware of fundamental operations of manufacturing an engineering component, enhance visualization and motivate them to innovate

Course Pre/Co-requisite (if any):

UNIT 1: Machine Shop
To make a machined-component using lathe with mild steel round bar or hexagonal bar Comprising of common turning operations with reference to drawing given in the manual.
Any one of the following jobs
Jobs: Hex Bolt, Axle for cycle wheel, Jig Bush, a typical turning specimen.

UNIT 2: Sheet metal Shop
To make a sheet metal component with galvanized iron sheet as per the drawing provided in the manual having spot welding joint.
Any one of the following jobs
Jobs: Square tray, Scoop, Funnel

Fitting Shop
To make a joint using fitting tools with mild steel flats, round bars or square bars as per the drawing provided in the manual.

UNIT 3: Welding Shop- Arc Welding
To prepare a welding joint with mild steel flat using Manual Metal Arc welding machine according to the drawing provided in the manual.
Any one of the following jobs
Jobs: Lap joint, Butt joint, Fillet/Corner joint

Gas & Spot Welding
To observe the demonstration of making a Lap joint/Butt joint with mild steel sheet using oxyacetylene flame as per the drawing provided in the manual. To perform the spot welding operation on G.I. sheet

UNIT 4: Carpentry Shop
To make a wooden joint with soft wood as per the drawing provided in the manual.
Any one of the following jobs
Jobs: T-Lap joint, Dove tail joint, Mortise & Tendon joint, Bridle joint.

UNIT 5: Foundry Shop
Introduction to foundry process like melting of metals, mould making, casting process and use of patterns to prepare of a component and significance of foundry.
Demo of mould preparation

Minor Project:
To make a minor project by the students in batches comprising the operations performed in different shops

Learning Outcome
At the end of the course, the student will be able to:
CO1: Have Capability to identify hand tools and instruments for machining and other workshop practices.
CO2: Obtain basic skills in the trades of fitting, carpentry, welding and machining
CO3: Acquire measuring skills, using standard workshop instruments & tools.
CO4: Gain eye hand co-ordination, enhance psycho motor skills and attitude.

Text book [TB]:

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
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Reference Books [RB]:


Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
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**Course Outline:**

**Course Objective:**

The objective of the course is to make the students to understand the key hardware components in a modern computer system and as to how the software is mapped to the hardware. The student shall also be able to learn make the computer programs using C language by exploring the various features of C.

**Course Pre/Co- requisite (if any):**

**Detailed Syllabus**

**UNIT 1: Introduction to Computer, Programming & algorithms**
Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)

Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples, From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code

**UNIT 2: Arithmetic Expression, and Conditional statements, Loops**

Expression:
Arithmetic, Logical, Relational expressions and precedence.

Loops & Branching: Writing and evaluation of conditionals and consequent branching, Iteration and loops.

**UNIT 3: Arrays & Functions**

Arrays: Arrays (1-D, 2-D), Character arrays and Strings.
Functions: functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference.

Searching & Sorting: Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

**UNIT 4: Fuels, Battery& Lubrication**

Recursion:
Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc.

Structure:
Structures, Defining structures and Array of Structures.

**UNIT 5: Pointers & File handling**

File handling: different modes of opening a file in C, reading, writing from files.

**Learning Outcome**

At the end of the course, the student will be able to:

CO1. To formulate simple algorithms for arithmetic and logical problems.
CO2. To implement conditional branching, iteration and recursion.
CO3. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
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CO4. To use arrays, pointers and structures to formulate algorithms and programs.
CO5. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems

Text book [TB]:

List of Experiments:
1. Familiarization with programming environment.
2. Programming for Simple computational problems using arithmetic expressions.
3. Programming for Problems involving if-then-else structures.
4. Programming for Iterative problems e.g., sum of series.
5. Programming for 1-D Array manipulation.
7. Programming for Simple functions
10. Programming for File operations
11. Programming for solving Numerical methods problems

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
OBJECTIVE
To impart basic knowledge about the environment and its allied problems and to develop an attitude of concern for the environment. Further the course structure will create the awareness about environmental problems among students and motivate the students to participate in environment protection and environment improvement programs. The course aims to develop skills to help the concerned individuals in identifying and solving environmental problems.

Unit 1: Basics of Environment and Natural Resources: 04 Hrs

Unit 2: Ecosystems: 04 Hrs

Unit 3: Biodiversity and its conservation: 04 Hrs

Unit 4 Environmental Pollutions: 05 Hrs

Unit-5 Social Issues and Environment: 04 Hrs

Field work: 03 Hrs
- Visit to a local area to document environmental asset: river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common flora and fauna.
- Study of a common ecosystem-pond, river, hill slopes, etc.
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
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Course Outcome:

At the end of the course, the student will be able to:

CO1. Demonstrate depleting nature of Environmental Resources and Ecosystem concepts.
CO2. Able to identify the structure and functioning of natural ecosystems.
CO4. Adapt to 3R (Reuse, Recovery, Recycle). Identify the causes and control measures related to Pollutions.
CO 5. Illustrate and analyse various Case Studies related to Environmental issues and Env. Legislation.

TEXT BOOKS

REFERENCES
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML) 
Applicable for Batch: 2019-23

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LTP 2 0 0 Credit 0

OBJECTIVE
To familiarize the students with the features of the Indian Constitution
To provide a knowledge of their constitutional rights

Unit 1 Introduction 5 Hrs
Constitution- meaning of the term, basic features Indian Constitution: Sources and constitutional history.
Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive, Principles of State Policy, debates on Fundamental Rights and Directive. 1 Hr
Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive, Principles of State Policy, debates on Fundamental Rights and Directive. 4 Hrs

Unit 2 Union Government and its Administration 6 Hrs
Structure of the Indian Union: Federalism, Centre- State relationship, 2 Hrs
President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha 2 Hrs
Institutional Functioning: Prime Minister, Parliament and Judiciary, Power Structure in India: Caste, class and patriarchy 2 Hrs

Unit 3 State Government and its Administration 3 Hrs
Governor: Role and Position, CM and Council of ministers, State Secretariat: Organisation, Structure and Functions 3 Hrs

Unit 4 Local Administration 7 Hrs
District’s Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected, Representative, CEO of Municipal Corporation. 3 Hrs
Pachayati Raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy 4 Hrs

Unit V: Election Commission 5 Hrs
Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.

COURSE OUTCOME:
CO 1 Enable the students to protect their rights
CO 2 The students will be engaged in the political system of India

TEXT BOOKS

REFERENCE BOOKS
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23


Objective:
The objectives of this course is to learn concepts of Discrete Mathematics and by applying the algorithms to solve the problems related to Recursion, combinatorial mathematics and problems on basic graph theory.

UNIT I: Unit 1: Introduction to Sets, Relations & Functions

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: Unit 2: Posets & Introduction to Boolean algebra

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.

UNIT III: Groups & Rings

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, Predicate Logic & Introduction to Probability

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: Introduction to Graphs & Recurrence Relations

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

Course Outcomes:
- An ability to perform operations on discrete structures such as sets, functions, relations, and sequences.
- An ability to construct proofs using direct proof, proof by contradiction, proof by cases, and mathematical induction.

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- An ability to demonstrate the ability to solve problems using counting techniques and combinatorics in the context of discrete probability.
- An ability to solve problems involving recurrence relations and generating functions.
- An ability to prove computational theorem

Text Books:

Reference Books:
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<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Title</th>
<th>Computer Organization</th>
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<td>CS212</td>
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<tr>
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<td>III</td>
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</table>

**OBJECTIVE:**

This course will facilitate the students to learn the fundamentals of computer organization and its relevance to classical and modern problems of computer design.

**Unit 1: Introduction to Register Transfer and Micro operation & Computer Arithmetic** (8)


**Computer Arithmetic:** Introduction, addition and subtraction algorithms, Booth Multiplication Algorithms, floating point arithmetic operation, IEEE format for floating point numbers.

**Unit 2: Processor Organization & Control Design.** (8)

**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 3 Input-Output Organization** (6)

**Input-Output Organization:** I/O Interface, Modes of transfer, Interrupts & Interrupt handling, Direct Memory Access, Input-Output processor, Serial Communication.

**Unit 4 Memory Organization** (6)

**Memory Organization:** Memory Hierarchy, Main Memory (RAM and ROM Chips), organization of Cache Memory, Virtual Memory, Memory management hardware.

**Unit 5: Parallel Processing & Multiprocessor** (8)

**Parallel Processing:** Flynn’s classification, Pipelining- Arithmetic Pipelining, Vector Processing, and Array Processor.

**Multiprocessor:** Characteristic of Multiprocessor, Interconnection Structure, Interprocessor Arbitration.

**COURSE OUTCOME:**

At the end of the course, the student can:

**CO1.** This will help the students to be familiarized with the hardware components and concepts related to the control design.

**CO2.** This also will help the students to be familiarized with addressing modes, different types of instruction formats, input-output organization.

**CO3.** The student will be able to learn the hardware components and concepts related to the memory organization.

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CO4. An ability to will be able to get the theoretical concept of parallel processing and different types of multiprocessor’s interconnection structures

TEXT BOOKS

REFERENCES
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<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Title</th>
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<td>Semester III</td>
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OBJECTIVE:
The objective of this course is familiarizing the students with the different kinds of data structure used for information storage and data retrieval in different applications of computer science.

Unit 1: Introduction to Algorithms & Data Structure
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: Queues & Link List
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 Trees
Binary Search Tree: Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, B-trees.

Unit-4 Graphs

Unit- 5: Searching, Sorting & File Handling:
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.

COURSE OUTCOME:
At the end of the course, the student can:

CO1. Students develop knowledge of basic data structures for storage and retrieval of ordered or unordered data. Data structures include: arrays, linked lists, binary trees, heaps, and hash tables.

CO2. Students develop knowledge of applications of data structures including the ability to implement algorithms for the creation, insertion, deletion, searching, and sorting of each data structure.

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CO3. Students learn to analyze and compare algorithms for efficiency using Big-O notation.

CO4. Students implement projects requiring the implementation of the above data structures.

TEXT BOOKS


REFERENCES


<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>EXPERIMENT NAME</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Program in C for the implementation of Array for various operations.</td>
</tr>
<tr>
<td>2</td>
<td>Program in C for the creation of Stack for its various operation implementation.</td>
</tr>
<tr>
<td>3</td>
<td>Program in C for the creation of Queue for its various operation implementation.</td>
</tr>
<tr>
<td>4</td>
<td>Program in C for the creation of Link list for its various operation implementation.</td>
</tr>
<tr>
<td>5</td>
<td>Program in C for the creation of Circular Link list for its various operation implementation.</td>
</tr>
<tr>
<td>6</td>
<td>Program in C for the creation of Doubly Link list for its various operation implementation.</td>
</tr>
<tr>
<td>7</td>
<td>Program in C for the creation of Binary Search Tree for its various operation implementation.</td>
</tr>
<tr>
<td>8</td>
<td>Program in C for the Implementation of sorting Algorithms.</td>
</tr>
<tr>
<td>9</td>
<td>Program in C for the Implementation of basic Graph Algorithms.</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Subject Code</th>
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<td>CS202</td>
<td>Java Programming Concepts</td>
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OBJECTIVE:
The objective of this course is familiarizing the students with the concepts of object oriented programming and its implementation in Java programming language.

Unit 1: Object Oriented Programming, Static & Dynamic models

Object Oriented Programming: Objects and classes, generalization and inheritance, aggregation, abstract class.
Static and dynamic models: UML diagrams: Class diagram, interaction diagram: collaboration diagram, sequence diagram, state diagram, activity diagram.

Unit 2: Introduction to Java, Class, Objects

Introduction to Java: Importance and features of Java, Keywords, constants, variables and Data Types, Operators and Expressions.
Branching and looping: if-else, switch, while, do, for statements, jump statements: break, continue, and return.
Introducing classes, objects and methods: defining a class, adding variables and methods, creating objects, constructors, inheritance, overriding, final class, and use of super keyword.

Unit 3 Arrays & Interface in Java

Arrays and Interfaces: Creating an array, string array, dynamic array, abstract classes, interfaces, extending interfaces, IO stream handling, and packages.

Unit 4 Multithreading, Exception handling, Applet and AWT

Multithreading: Thread, thread life cycle, extending thread class, implementing runnable interface, thread synchronization.
Exception handling: inbuilt and user defined exceptions.
Applet and AWT: Introduction to applet, event handling, event classes and listeners, handling images.

Unit 5: Introduction to Swings

Introduction to Swings: Features of swings, swing UI elements, sample cases developing user interfaces using Swing UI classes, design animation, sound and video application using swings.

COURSE OUTCOME:
At the end of the course, the student can:
CO1. Able to learn Identify classes, objects, members of a class and relationships among them needed for a specific problem.
CO2. Able to learn Java application programs using OOPS principles and proper program structuring.
CO3. Able to Java programs to implement error handling techniques using exception handling.

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CO4. Able to GUI programs in java and embed with web pages.

TEXT BOOKS

REFERENCES

<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>EXPERIMENT NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Program in Java to design simple calculator for (+, -, *, and /) using switch case</td>
</tr>
<tr>
<td>2</td>
<td>Program in Java to design accounts class and two functions withdraw() and deposit().</td>
</tr>
<tr>
<td>3</td>
<td>Program in Java to show the inheritance in java and use of super keyword.</td>
</tr>
<tr>
<td>4</td>
<td>Program in Java to the concept of polymorphism by designing functions to sum different type of numbers</td>
</tr>
<tr>
<td>5</td>
<td>Program to show the concept of method overriding in Java.</td>
</tr>
<tr>
<td>6</td>
<td>Program in Java that import the user define package and access the Member variable of classes that Contained by Package.</td>
</tr>
<tr>
<td>7</td>
<td>Program in C for the creation of Binary Search Tree for its various operation implementation.</td>
</tr>
<tr>
<td>8</td>
<td>Program in Java to handle the Exception using try and multiple catch block.</td>
</tr>
<tr>
<td>9</td>
<td>Program in Java to create a thread that Implement the Runable interface</td>
</tr>
<tr>
<td>10</td>
<td>Program in Java to create Frame that display the student information using awt components</td>
</tr>
<tr>
<td>11</td>
<td>Program in Java to create frame for course enquiry using Swings components.</td>
</tr>
</tbody>
</table>
OBJECTIVE:

This course aims to educate students on the role of a well-structured relational database management system (RDBMS) to the efficient functioning of an organization. This course covers theory and practice in designing a relational database management system with example of a current database product of MYSQL. Students also learn about the important concepts of database integrity, security and availability with techniques like normalization, concurrency control and recoverability control.

Unit 1: Introduction to Database System
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: E-R modeling Data Base Design

Unit 3 Relational Model & SQL
Relational Model: 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 Database Design Concepts
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: Transaction & Concurrency
Transaction Management: Transaction-concepts, states, ACID property, schedule, serializability of schedules, concurrency control techniques - locking, timestamp, deadlock handling, recovery-log based recovery, shadow paging.

COURSE OUTCOME:

At the end of the course, the student will able to learn:
CO1. To work on MySQL database management system.
CO2. To create database and query the database for information retrieval.
CO3. To design a database so that data redundancy, data inconsistency and data loss problems may be resolved.
TEXT BOOKS

REFERENCES

<table>
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<tr>
<th>SR.NO.</th>
<th>EXPERIMENT NAME</th>
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<tbody>
<tr>
<td>1.</td>
<td>Implementation of Data Definition language in Query Language.</td>
</tr>
<tr>
<td>2.</td>
<td>Implementation of Data Manipulation in Query Language.</td>
</tr>
<tr>
<td>3.</td>
<td>Insertion &amp; Updation of records in Database table</td>
</tr>
<tr>
<td>4.</td>
<td>Implementation of GROUP functions (avg, count, max, min, Sum).</td>
</tr>
<tr>
<td>5.</td>
<td>Execution of the various type of SET OPERATORS (Union, Intersect, Minus).</td>
</tr>
<tr>
<td>6.</td>
<td>Apply the various types of Integrity Constraints on table.</td>
</tr>
<tr>
<td>7.</td>
<td>Creation of various types of JOINS.</td>
</tr>
<tr>
<td>8.</td>
<td>Implementation of Views and Indices in database.</td>
</tr>
<tr>
<td>10.</td>
<td>Modify the database structure and drop the record with structure.</td>
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</table>
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML) 
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OBJECTIVE:
To acquire the basic knowledge of digital logics and application of knowledge to understand digital electronics circuits.
To prepare students to perform the analysis and design of various digital electronic circuits.

COURSE OUTCOME:
At the end of the course, the student can:
CO1. To understand and examine the structure of various number systems and its application in digital design
CO2. Have a thorough understanding of the fundamental concepts and techniques used in digital electronics.
CO3. The ability to understand, analyze and design various combinational and sequential circuits.
CO4. To develop skill to build digital circuits.

UNIT I – INTRODUCTION: 10 HRS
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 II – COMBINATIONAL LOGIC CIRCUITS: 10 HRS
Characterization of digital circuits: Combinational & Sequential Logic circuit.
Design Procedure-Other Circuits: Parity checker and generator,
Code Conversion: Binary to BCD, BCD to Binary, BCD to Excess-3, Excess-3 to BCD.

UNIT III – SEQUENTIAL LOGIC CIRCUITS: 06 HRS
Latches: SR, S R (S Bar and R Bar), D latch. Race around condition, Propagation Delay.
Flip-Flops: SR, D, JK & T Flip Flops and their conversions, Master-Slave Flip Flop, Edge Triggered Flip-Flop, Characteristic Table, Characteristic Equation, State Table, State Diagram, Excitation Table & Diagram, Analysis with JK Flip-Flop, Design Procedure of Sequential Circuits, Designing with unused states.
Finite State Machine: Mealy and Moore Models.

UNIT IV- APPLICATION OF SEQUENTIAL LOGIC CIRCUITS: 08 HRS
Registers: Registers with Parallel Load, Serial Transfer, Shift Registers with Parallel Load, Bidirectional Shift Register, Universal Register.
Counters: Synchronous Counters - Binary Counter, Counter with D Flip-Flop, Up & Down Counters, BCD/Decade Counters.

UNIT V- LOGIC FAMILIES & PROGRAMMABLE LOGIC DEVICES:
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.

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TEXT BOOKS

REFERENCES

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<tr>
<th>SR.NO.</th>
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<tbody>
<tr>
<td>1</td>
<td>Implementation of All Logic Gates using Universal gates (NAND &amp; NOR both).</td>
</tr>
<tr>
<td>2</td>
<td>Bread-board implementation (Parallel adder, One bit Multiplier, One bit Magnitude comparator, parity checker)</td>
</tr>
<tr>
<td>3</td>
<td>Bread-board implementation of any one code converter (i.e. Gray Code, BCD Code, Excess-3, Hex. etc.).</td>
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<tr>
<td>4</td>
<td>Design of shift registers (SISO, SIPO, PIPO, and PISO), up and down counters.</td>
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<tr>
<td>5</td>
<td>Design of Mod-6 types of Asynchronous Counters.</td>
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<tr>
<td>6</td>
<td>Transfer characteristics of TTL and CMOS inverters.</td>
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<tr>
<td>7</td>
<td>Realization of Decoder, Multiplexer, encoder and De-multiplexers using IC 74138.</td>
</tr>
<tr>
<td>8</td>
<td>To design &amp; Implement PAL.</td>
</tr>
<tr>
<td>9</td>
<td>To design &amp; implement PLA.</td>
</tr>
<tr>
<td>10</td>
<td>Clock circuit realization using 555, CMOS inverter.</td>
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**Course Outline:** This is a module having basics of aptitude coupled with Soft Skills to help students set the tone for aptitude training to create readiness for campus placement and various competitive exams for Government & non-corporate set-ups. The various tools used in the classes will help them rediscover & reinvent themselves.

**Course Objective:**
1. Prepare students for becoming confident and corporate-culture fit
2. Get them equipped with the aptitude tools to handle workplace stressors and manage time properly
3. Help them improve their interpersonal skills

**Course Pre/Co-requisite (if any):** Basic understanding of elementary Mathematics and Logical reasoning and basic understanding of Soft Skills.

**Detailed Syllabus**

**UNIT 1: QUANTITATIVE APTITUDE**
05 hours
Simplification: Duplex method for finding square; Vedic mathematics tricks for multiplication of 2, 3, 4 digit numbers; BODMAS application, Finding square roots and cube roots; Introduction to Surds and Indices.
Ages Problems based on ages solving with algebraic equations; Concept of hence time and past time.
Averages: Basic Concepts; Weighted Average; Basic understanding of mean, median and mode; Application of average on ages, speed time distance and series.

**UNIT 2: VERBAL APTITUDE**
05 hours
Sentences- Types of sentences, Parts of Speech- application based approach.
Vocabulary: Understanding word structure, common roots, prefixes, suffixes, Mnemonic method.
Speed Reading: Easy to medium passages-techniques and practical applications, Idioms and phrases.
Activities- Words from Dictionary, Newspaper and other sources (theme based).

**UNIT 3: LOGICAL REASONING**
06 hours
Clock and Calendar, Cubes – Structure of cube, cutting rules, cutting the painted cube into identical cubelets and Dice reasoning – rule detection, pattern completion, image analysis.
Missing Number, Mathematical operation, Inequality, Number puzzles.

**UNIT 4: SELF-ANALYSIS & INTERPERSONAL SKILLS**
05 hours
MBTI and other personality tests, strategies to develop interpersonal skills.
**Suggested Activities & Games:** (i) I Am (ii) Flip (iii) A Letter to Yourself, (iv) Card Pieces, (v) Blindfold Game, (vi) Crazy Comic.

**UNIT 5: PRESENTATION SKILLS**
05 hours
Principles of Effective Presentations, Do’s and Don’ts of Formal Presentations, How to prepare for a formal presentation, Presentation Exercises a) Welcome speech, c) Farewell Speech, d) Vote of thanks etc.
**Suggested Activities & Games:** (i) Stand Up for Fillers, (ii) Mimes, (iii) Short Speech Challenge.

**Learning Outcome**
1: Get to know more about their personality and gain people skills.
2: Be able to deliver presentations more confidently.
3: Will have a firm base ready for the upcoming years for the aptitude part.

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Text book [TB]:

Reference books [RB]:
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**LTP**: 3 1 0  
**Credit**: 4  
**Subject Category**: SC  
**Year**: 2nd  
**Semester**: IV

**OBJECTIVE:** The objectives of the course are to familiarize the students with statistical techniques, to equip them with standard concepts and, to learn tools of probability theory to solve engineering problems.

**Unit I: Descriptive Statistics and Probability**

**Unit II: Random Variables and Probability Distributions**
Discrete & continuous random variables and their properties, mass function, density function, distribution functions. Expectation, moment generating function, Binomial, Poisson, Exponential & Normal distributions and their applications.

**Unit III: Correlation and Regression**
Bivariate distributions and their properties, Joint and marginal density functions, Conditional densities. Covariance, Correlation, Regression, Regression lines. Curve fitting by the method of least square-fitting of straight lines.

**Unit IV: Hypothesis Testing**
Population and samples, Sampling distribution of statistic, standard error. Null and Alternative Hypothesis, critical region, critical values and level of significance. One tail and two-tail tests, confidence interval, Errors in testing of hypothesis; Type I and Type II errors, power of the test.

**Unit V: Inferential test procedures**
Test of significance, large sample test for single proportion, difference of proportion, single mean, difference of means and difference of standard deviation. Small sample test: Student’s t-test and it’s applications, F-test and it’s applications. Chi-square test for goodness of fit and independence of attributes.

**LEARNING OUTCOME:** Students will be able to:
- Compute probability, various discrete and continuous probability distributions of random variables and their properties.
- Use the tools of statistics including measures of central tendency, correlation and regression.
- Use statistical methods for studying data samples.
- Use large sample and small sample tests.

**Text Books:**

**Reference Books:**

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OBJECTIVE:

This course will facilitate the students to learn the mathematical foundations of computation including automata theory; the theory of formal languages and grammars; the notions of algorithm, decidability, complexity, and computability.

Unit 1: Introduction to Finite Automata.

Introduction to Mathematical foundation for automata: Mathematical preliminaries, alphabets, strings, languages, states, transition, transition graph, generalized transition graph.

Finite Automata: Deterministic Finite Automata, Non-Deterministic Finite Automata, Non-Deterministic Finite Automata with ε transitions, minimization of DFA.

Unit 2: NFA & FA with output

Conversions and Equivalence: Equivalence between NFA with and without ε transitions. NFA to DFA conversion.

Application of FA: Equivalence between two DFA’s, Limitations of FSM; Application of finite automata, Finite Automata with output- Moore & Melay machine and its conversion.

Unit 3 Grammars & context Free Language

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: Grammar for CFL, 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 Pushdown Automata

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: Turing Machine & Computational Decidability

Turing Machine: Turing Machine, definition, model, Design of TM, Computable functions Church’s hypothesis, Types of Turing machines, Universal Turing Machine, Halting problem.


COURSE OUTCOME:

At the end of the course, the student will able to:

CO1. Analyze and design finite automata, pushdown automata, Turing machines, formal languages, and grammars.

CO2. Demonstrate their understanding of key notions, such as algorithm, computability, decidability, and complexity through problem solving.
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
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CO3. Prove the basic results of the Theory of Computation.

CO4. State and explain the relevance of the Church-Turing thesis.

TEXT BOOKS

REFERENCES
Objective:
This course will facilitate the students to learn the different components and various functioning of an operating system.

Unit 1: Introduction to Operating System. (8)


Unit 2: Management & Scheduling (6)


Unit 3 Concurrent Processes & Deadlocks (8)

Deadlock: System Model, Deadlock Characterization, Prevention, Avoidance and Detection, Recovery from deadlock.

Unit 4 Memory Management (7)
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-5: File Systems & I/O Management (7)
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).

Course Outcome:
At the end of the course, the student will able to:

CO1. Learn the general architecture & functioning of computers with operating system.

CO2. Describe, contrast and compare differing structures for operating systems.

CO3. Understand and analyze theory and implementation of: processes, resource control (concurrency etc.).

CO4. Understands physical and virtual memory, scheduling, I/O and files.

Text Books

References
OBJECTIVE:
The objective of this course is familiarizing the students with the concepts of networking in computers, routing of data packets on the network and protocols followed in the networked computers.

Unit 1: Introduction to Computer Network
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: Data Link Protocol

Unit 3 Routing algorithms of Data Packets in networked computers
Routing Algorithms: Distance-Vector, Link-State, Shortest path computation, Dijkstra's algorithm, Congestion control, WAN technologies including frame relay, X.25, ATM.

Unit-4 Interworking & IP addressing
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: Introduction to Network Services
Network Services: Electronic mail, File transfer, Access and management, Virtual terminals, Remote procedure call.

COURSE OUTCOME:
At the end of the course, the student can:

CO1. An ability to perform Design and simulation of protocol using simulation tool.

CO2. Ability to create reliable communication using communication model with high quality of service.

CO3. Able to understand the data Packet Routing in networked computers.

CO4. Able to understand the protocols followed used in computer networks.
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
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TEXT BOOKS

REFERENCES

<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>EXPERIMENT NAME</th>
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<tbody>
<tr>
<td>1</td>
<td>Simulate a network having two communication node using Cisco packet Tracer.</td>
</tr>
<tr>
<td>2</td>
<td>Simulate a network having 4 communication nodes with one switch.</td>
</tr>
<tr>
<td>3</td>
<td>Simulate a network having Two subnet using 2 switch, one Router and 6 nodes using Cisco packet tracer</td>
</tr>
<tr>
<td>4</td>
<td>Simulate a network having Two subnets and two Routers using DTE/ DCE Cable with user defined clock rate.</td>
</tr>
<tr>
<td>7</td>
<td>Simulate a network using Ring Topology Using Cisco packet Tracer.</td>
</tr>
<tr>
<td>8</td>
<td>Simulate a network using Mesh Topology Using Cisco packet Trace.</td>
</tr>
<tr>
<td>9</td>
<td>Create a DHCP server using Cisco packet tracer</td>
</tr>
<tr>
<td>10</td>
<td>Implement Intra domain and Inter domain routing Protocol using Cisco Packet Tracer.</td>
</tr>
<tr>
<td>11</td>
<td>Implement Bit Stuffing using Turbo C++ Editor.</td>
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</table>
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<table>
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<th>Subject Code</th>
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<td>Credit</td>
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</table>

OBJECTIVE:
This course aims to provide the knowledge to understand the concepts and elementary use of .NET library such as development of windows application and website creation through ASP.NET. Students are also able to learn about the different validation and use of controls available in Visual Studio.

Unit 1: Introduction to Dot Net (8)

Introduction to C#: C# Language Fundamentals, Namespace, Using Directive, Defining custom namespaces, Default Assignment and variable scope, Basic input and output with the console class, Understanding value types and reference types, Converting between value type and reference type: Boxing and Unboxing, Operators and Expressions, Iterations constructs, control flow constructs, Understanding static methods, Method parameter modifiers, Array manipulation, String manipulation, Enumerations, Defining structures.

Unit 2: Object Oriented Aspects Of C# (8)
Object Oriented Aspects Of C#: Formal definition of the class, Constructor, type of constructor, Destructor, member access modifier(Public,Private,Protected,Internal and Protected Internal), Encapsulation, Polymorphism: Method Overriding and Method Overloading, Override, Virtual, new Keywords, Inheritance: Types of Inheritance and Interface, Abstraction, Sealed Class, Property, Set and get operator, Indexer, Reflection, Delegates and Events.

Unit 3 Exception Handling in C# (8)
Exception, Bug, Error, Exception Handling in .Net, Type of Exception, finally statement, throw and rethrow, difference between System Level Exception and Application Level Exception, Nested try block, Custom Exception, throwing our own exceptions, checked and unchecked operator, handling multiple exception. Garbage collection: Basics, working, finalizing a method, Dispose (), IDisposable Interface, System.GC Type.

Unit 4 Architecture (7)
Three tier architecture, MVC architecture, Entity Framework. Windows Forms: All about windows form, MDI form, creating Windows applications, adding controls to forms, handling Events, and using various Tools.

Unit 5: Database & Web Application (8)
ADO.NET- ODBC, OLEDB, and SQL connected mode, disconnected mode, dataset, data view, data table, data column, data row, data-reader, data adapter.


COURSE OUTCOME:
On successful completion of this course, student should be able to:
CO1. To have knowledge of the structure and model of the programming language C #.
CO2. To Use the programming language C # for various programming technologies.
CO3. To develop software in C #.
CO4. To design web applications using ASP.NET.

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
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TEXT BOOKS

REFERENCES

<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>EXPERIMENT NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Program in C# to demonstrate System.Array class members like Clone(), Copy(), Clear(), Sort() and Reverse().</td>
</tr>
<tr>
<td>2</td>
<td>Program in C# to demonstrate System. String members like Contains(), Insert(), Remove(), Replace() and ToUpper().</td>
</tr>
<tr>
<td>3</td>
<td>Program in C# Create a Simple Calculator using Text Boxes and Button Tools of Visual Studio which also calculates %, modulus, Root, Clear, Sign Change, and Result</td>
</tr>
<tr>
<td>4</td>
<td>Design Login form and create windows form using basic form controls application.</td>
</tr>
<tr>
<td>5</td>
<td>Design a form in C# that takes the details of a person (Name, Address and DOB) and enables Radio Button to vote if the age of the person is above 18 and then shows a thanks message.</td>
</tr>
<tr>
<td>6</td>
<td>Create a form using Menu Strip Tool and add the following options: File, Edit, Help. Also add submenu, for File add: Open, Close and Exit. For Edit add: Cut, Copy and Paste. For Help add: Help and About.</td>
</tr>
<tr>
<td>7</td>
<td>Create a windows application which stores an Item (Item_Id, Name, Price, Weight, Type, quantity) in a database. After that there will be a button to view the Detail of Items added. After that create another form from which Item can be removed and Updated.</td>
</tr>
<tr>
<td>8</td>
<td>Create a Registration Form with all validations to store the information of a Student in a database. Create Another windows form to assign Elective Subjects to all the students.</td>
</tr>
<tr>
<td>9</td>
<td>Create a website for a book store, which sold and give books on rent to customers. Also Store the information of customers</td>
</tr>
<tr>
<td>10</td>
<td>Write a Program to demonstrate System.Array class members like Clone(), Copy(), Clear(), Sort() and Reverse().</td>
</tr>
</tbody>
</table>
OBJECTIVE:
This course aims to provide the knowledge and understanding to python programming so that students will able to simulate the problems in Python as per their requirements.

<table>
<thead>
<tr>
<th>SR.NO.</th>
<th>EXPERIMENT NAME</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Program that prompts the user to enter five words. If the length of any word is less than 6 characters, then it asks the user to enter it again. However, if word is of 6 or more characters, then it displays it on the screen.</td>
</tr>
<tr>
<td>2</td>
<td>Program to perform following operations on the strings: zfill(), max(), min(), split(), join(), isidentifier(), strip().</td>
</tr>
<tr>
<td>3</td>
<td>Program that encrypts a message by adding a key value to every Character (Caesar Cipher). Hint if key=3, then add 3 to every character</td>
</tr>
<tr>
<td>4</td>
<td>Program to sort the list using function.</td>
</tr>
<tr>
<td>5</td>
<td>Program to store sparse matrix as dictionary.</td>
</tr>
<tr>
<td>6</td>
<td>Program to write a function that reads a file and display the number of words and the number of the vowels in the files.</td>
</tr>
<tr>
<td>7</td>
<td>Program that plot the following functions in the range 0 degree to 360 degree in the same figure: sine, cosine, tan, cot.</td>
</tr>
</tbody>
</table>

COURSE OUTCOME:
On successful completion of this course, student should be able to:
CO1. To have knowledge of the structure and model of the programming in Python.
CO2. Experience with an interpreted Language.
CO3. To build software for real needs.

TEXT BOOKS

REFERENCES
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
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<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Title</th>
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<td>Aptitude and Soft Skills II</td>
<td>200</td>
<td>0</td>
<td>AC</td>
<td>II</td>
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</table>

Course Outline: This module is focused on providing students more hands-on practice on aptitude problems and prepare a stronger fundamental base for Aptitude and Soft Skills III and IV. Employability skills will help students improve their employability.

Course Objective:
1. Prepare a ground for the students to be ready in Quantitative, Logical Aptitude and Verbal Aptitude
2. Prepare them for becoming confident and corporate-culture fit as present-day workplace requires professionals who are not only well qualified and competent but also possess Soft Skills like interpersonal skills and good presentation skills

Course Pre/Co-requisite (if any): Basic understanding of simplification and calculation tricks, non-verbal pattern completion LR, covered in Aptitude and Soft Skills I.

Detailed Syllabus

UNIT 1: QUANTITATIVE APTITUDE
Basic algebraic equations (linear equations in one variable), polynomials and Algebraic Inequalities; logarithm. Quadratic Equations (concept of determinant, real, non-real, rational and conjugate roots); Geometry and Mensuration; Heights and Distances.

UNIT 2: VERBAL APTITUDE
Figures of speech; Determiners. Creative Writing: Essay, Report Writing, Article, Letters, E-mail, difference between formal and informal tone, appropriate use of transition words, creating a signature, understanding different situations and the responses they require (situation-based writing), Proper use of connectors.

UNIT 3: LOGICAL REASONING
Input Output – Sequential output tracing of logical operations applied on machine input, Ranking and Order- Test - Ordering of measurable attributes like height / weight / performances, etc. Eligibility test, Logical sequences and series, Completion of incomplete pattern, Odd figures or Odd man out, Analogies, Coding Decoding basics.

UNIT 4: LEADERSHIP & TEAM BUILDING SKILLS
Importance, How to develop Leadership Skills? Best Leadership & Team Building Examples.

UNIT 5: EMPLOYABILITY SKILLS & CV WRITING
What Skills Do Employers Expect From Graduates? CV vs. Resume, CV writing Do’s & Don’ts, Tips with Best Examples/ Samples, Feedback Sharing & Error Analysis.

Suggested Activities & Exercises: (i) Relevant Videos on ‘Employability’, (ii) Group Discussions on Newspaper Articles, (iii) Sample correction, (iv) writing exercise.

Learning Outcome
1: Develop Leadership & Team Building Skills.

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
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2: Receive hands-on guidance to develop an effective CV.
3: The students would be able to understand the basic trends of questions asked in the aptitude part of placements.

Text book [TB]:
3. Verbal Aptitude: English is Easy - Chetanand Singh, BSC Publication - 2018

Reference books [RB]:
   Soft Skills: No Excuses – Dr Wayne Dyer, Hay House Inc.
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<table>
<thead>
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<th>Subject Title</th>
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OBJECTIVE:

This course aims to provide the knowledge and understanding the complexity issues of algorithms
1. To introduce algorithms analysis and design techniques
2. To understand and design of algorithms used for searching, sorting, indexing operations

Unit-I

Unit-II
Advanced Data structures: B-Tree, Binomial Heaps, Fibonacci Heaps, Red& Black Tree.

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.

LEARNING OUTCOMES

CO1. Analyzing complexity issues of algorithms
CO2. Ability in using the appropriate algorithm for searching, sorting, indexing operations
CO3. Designing of new algorithms
CO4. Student will be able to learn NP Class problems.

Text Book:

Reference Book:
ARTIFICIAL INTELLIGENCE

OBJECTIVES: To provide the foundations for AI problem solving techniques and knowledge representation formalisms.

Unit-1 (6 L)
Introduction- Definitions, Intelligent Agents, Problem solving and Search- Uninformed Search, Informed Search, MiniMax Search, Constraint Satisfaction Problem.

Unit-2 (6 L)
Prolog- Introduction to Prolog, Syntax and Meanings of Prolog Programs, Operators and Arithmetic, Prolog for Artificial Intelligence.

Unit-3 (8 L)
Knowledge Representation- Introduction, Approaches and Issues in Knowledge Representation, Propositional Logic and Inference, First-Order Logic and Inference, Unification and Resolution.

Unit-4 (8 L)

Unit-5 (8 L)
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.

LEARNING OUTCOMES
CO1. Ability to identify and formulate appropriate AI methods for solving a problem
CO2. Ability to implement AI algorithms
CO3. Ability to compare different AI algorithms in terms of design issues, computational complexity, and assumptions
CO4. Student will be able to use the concepts of AI for real world problem solving.

Text Books:-

Reference Books:-
**Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)**

**Applicable for Batch: 2019-23**

<table>
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<tr>
<th>Subject Code</th>
<th>Subject Title</th>
<th>Genetic Algorithms &amp; Fuzzy Logic</th>
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**COURSE OBJECTIVE:**

The objective of this course is to introduce students to the particulars of Genetic Algorithms and Fuzzy Logic which are used for solving hard problems which are not amenable to standard methods such as calculus based computations. Genetic algorithms and Fuzzy Logic aims for approximate solution to problems and are robust, yet easy to design. Students will get a broad understanding of the theory and concept of the subject and its wide applications in Computer Science.

**Unit 1: Theoretical foundation of Genetic Algorithms** (8L)


**Unit 2. Introduction to Fuzzy Sets** (7L)

Basic Concepts of Crisp sets vs. Fuzzy Sets, Membership Function, Fuzzification, Fuzzy Set operations, Relation Matrix, Min-Max Theorem, De-fuzzyfication, MOM and COG method.

**Unit 3. Introduction to Fuzzy Logic** (8L)


**Unit 4. Reasoning with Uncertain and Incomplete Information- Statistical Approach** (8L)


**Unit 5. Combination of Genetic algorithms and Fuzzy Logic** (8L)


**Learning Outcome:** Upon completion of the course, students will be able to:

- **CO1.** Understand the concept and theories of Genetic Algorithm and Fuzzy Logic.
- **CO2.** List the facts and outline different steps carried out in Genetic algorithms and Fuzzy logic.
- **CO3.** Apply Genetic algorithms to search large solution space of ciphers for the correct decryption of codes.
- **CO4.** Apply Genetic algorithm to combinatorial optimization problems.
- **CO5.** Apply Fuzzy logic for control system design.
- **CO6.** Design Fuzzy knowledge base using Genetic algorithm.
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Text Books

Reference Books
OBJECTIVES: This course is designed to provide solutions of nonlinear equations in one variable, interpolation and approximation, numerical differentiation and integration, direct methods for solving linear systems, numerical solution of ordinary differential equations.

Unit I: (8 L)

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 Raphson methods.

Unit II: (8 L)
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: LaGrange’s Interpolation, Newton Divided difference Formula.

Unit III: (6 L)
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: (8 L)

Unit V: (6 L)

LEARNING OUTCOMES
CO1. Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.
CO2. Apply numerical methods to obtain approximate solutions to mathematical problems.
CO3. Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration.
CO4. The student will learn the solution of linear and nonlinear equations, and the solution of differential equations.

Text Book:

Reference Book:
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<table>
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<th>Subject Code</th>
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<tr>
<td>CS342</td>
<td>LINUX ADMINISTRATION AND SHELL PROGRAMMING</td>
<td>3 0 2</td>
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OBJECTIVES: This course is designed to get the exposure to the students about the functioning and shell programming in Linux operating system.

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 III
Connecting to remote machines, Network routing utilities, Remote file transfer, Other Internet related utilities, User Information and Communication, Printer control, Email utilities. Server Configuration in Linux environment: Telnet, FTP.

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, Cronjobs, 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. C/C++ code execute in Linux platform.

LEARNING OUTCOMES
After the completion of the course the students will able to learn:
CO1. About the Linux installation & working of Linux commands.
CO2. Know the network related activities on the computer system.
CO3. Expertise in shell programming using Linux.
CO4. The student will learn about System Administration in Linux.

Text Book:

Reference Book:
1. O’Reilly Media “Linux System Administration”

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
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<table>
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<tr>
<th>Subject Code</th>
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<td>CS343</td>
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OBJECTIVES:
1. To understand the Object-based view of Systems
2. To develop robust object-based models for Systems
3. To inculcate necessary skills to handle complexity in software design.

UNIT 1 (6 L)
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 (8 L)

UNIT 3 (8 L)
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 (6 L)
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 (8 L)

LEARNING OUTCOMES
After the completion of the course students will able to learn
CO1. Ability to analyze and model software specifications.
CO2. Ability to abstract object-based views for generic software systems.
CO3. Ability to deliver robust software components.
CO4. The student will be able to design projects using Advance concepts of OOPs.

Text Book:

Reference Book:
5. Cay S Horstmann & Gary Cornell, Core Java Vol II Advanced Features, Addison Wesley

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
The objective of this course is to study in-depth understanding of various aspects of cloud computing and be able to implement cloud services in an effective manner cloud Technologies.

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

LEARNING OUTCOMES
At the end of course the students will able to learn
CO1. Analyze the Cloud computing setup with it’s vulnerabilities and applications using different architectures.

Design different workflows according to requirements and apply map reduce programming model.

CO2. Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms.

CO3. Create combinatorial auctions for cloud resources and design scheduling algorithms for computing clouds.

CO4. Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application.

Text Book:
2. B. Sosinsky, Cloud computing Bible, Ed. Reprint Willy India Pvt. Ltd, 2014,

Reference Book:
Course Objective

- The objective of this course is to familiarize B.Tech. Students with the roles, responsibilities, and skills required of modern managers.
- This course will be present the concepts of management as it applies to current thinking in the workplace.

Unit 1 Overview of management 5 Hrs.
Definition-Management-Role of managers-Organization and the internal and environmental factors –Trends and Challenges of Management in India.
Directing – delegation –span of control– communication, Controlling

Unit 2 Management Information 4 Hrs.
Introduction to functional areas of management, Operations management, Human resources management, Marketing management, Financial management

Unit 3 Planning Approach to Organizational Analysis 10 Hrs.
Design of organization structure; job design and enrichment; job evaluation and merit rating

Unit 4 Motivation and Productivity 7 Hrs.
Theories of motivation, Leadership styles and Managerial grid. Co-ordination, monitoring and control in organizations. Techniques of control; Few Cases on current management issues in India

COURSE OUTCOME:

- To present the topics in management, management theories, while at the same time focusing on practical applications in the real world especially for engineers.
- Evaluate the global context for taking managerial actions of planning, organizing and controlling.
- Assess global situation, including opportunities and threats that will impact management of an organization.
- Integrate management principles into management practices.

TEXT BOOKS:
1. Schermerhorn, Management and Organisational Behaviour essentials, Wiley India
4. A V Rau: Management Science, BSP, Hyderabad
6. Stephan R Robbins Fundamental of Management, Pearson

REFERENCE BOOKS

- Mahadevan, B., Operations Management, Theory and Practice, Pearson Education Asia, 2009
Course Objective

- To increase awareness for relevance of positive emotions at workplace.
- To equip students with psychological skills to maximize happiness and virtues like compassion, love and wisdom through experiential, workshop based and interactive activities along with assigned lectures and reading

Unit 1 What is positive psychology? 7Hrs.
Introducing Positive Psychology: Definition, goals, assumptions, key concepts and relationships with health psychology, developmental psychology, social psychology and psychology of religion, Meaning and measure of Happiness: Hedonic and Eudemonic perspective, Yogic notion of bliss

Unit 2 Positive Emotions, Cognitive states and Well-being 9Hrs.
What are positive emotions? The broaden and build theory, relevance of positive emotional states for physical, social & psychological resources, Positive emotions and well-being: Happiness and positive behavior, positive emotions and success, resilience, Self-efficacy, Optimism, Hope, Wisdom, Mindfulness and flourishing

Unit 3 How to enhance well-being? 5Hrs.
Use of postures, breathing practices, Sounds, dietary consumption

Unit 4 Positive Psychology at work place 5Hrs.
Maximizing achievement, conflict resolution, gratitude, positive leadership

COURSE OUTCOME:

- Students learn about modern psychological knowledge of happiness.
- Students acquire skills to cultivate positive emotions.
- Measure and build individual, workplace and educational flourishing; plan, implement and assess positive psychology.
- Students will gain an understanding of what contributes to well-being and how to build the enabling conditions of a life worth living.

TEXT BOOK:

REFERENCE BOOKS:
Course Objective:
- To provide the basic overview of economics in engineering perspectives.
- To increase the understanding of students to solve the engineering problems through economic theories.
- To increase the understanding of students to use economics theories in project investment of industries

Unit 1 General Overview of Economics  
6 Hrs.
Nature and Scope of Economics in engineering perspective; Theory of Demand Analysis: Meaning and Types, Law of demand, Exceptions to the Law of Demand, Elasticity of Demand; Theory of Supply Analysis: Law of Supply and Elasticity of Supply; Mathematical Explanation on cost, revenue and profit function

Unit 2 Production Function and Its Applications  
6 Hrs.
Production Function: Short-run and long-run Production Function; Mathematical Explanation: Laws of Returns to Scale & Law of Diminishing Returns Scale; Concept of Cost and Its Types: Total cost, fixed cost, variable cost, average variable cost, average fixed cost, marginal cost, explicit and implicit cost; Break-Even-Analysis: Importance and graphical presentation, mathematical problems

Unit 3 Time Value of Money and Project Evaluation  
8 Hrs.

Unit 4 Banking and Finance  
6 Hrs.

COURSE OUTCOME
- Students will be able to apply economic principles and calculations to solve engineering projects.
- To students will be efficient to get the idea of production activities and its applications in industries.
- Students will be competent to estimate the present and future value of money on their various investment plans.
- Develop the ability to account for time value of money using engineering economy factors and formulas, as well as the implications and importance of considering taxes, depreciation, and inflation.

TEXT BOOKS

REFERENCE BOOK
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23

Humanities Electives II

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<td>Literature, Language &amp; Society</td>
<td>2-0-0</td>
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Course Objective

- The focus of the programme is on the interaction between literature & Society, and Literature and visual culture.
- To discuss how Literature reacts to major changes in society.

Unit 1

Unit 2
Approaches to the Study of Literature, Reader response to the study of Literature, Interpretation, Appreciation, Evaluation, Special problems in understanding Modern Literature.

Unit 3
Social dimension of language. problems of multilingual communities, dominance and conflict, shift and attrition, language and the state, language and nation, Indian multilingualism, language variation, language and identity, linguistic prejudice and inequality, standardization, linguistic determinism, critical discourse analysis, and methodological issues.

Unit 4
Jerome K Jerome: Three Men on a Bummel (selection), Martin Amis: Last Days of Muhammad Atta, Li Ho: A Girl Comb her hair, R.K. Narayan: Malgudi Days (selection)

COURSE OUTCOME

- Students will read critically from a variety of genres, specifically poetry, drama, non fiction, and fiction.
- Students will read literature more carefully and meaningfully, practicing close-reading skills.
- Students will understand the relation between historical and cultural contexts.
- The students will develop a critical understanding of how literature can both uphold and resist existing structures of power.

TEXT BOOKS
2. R.K. Narayan: Malgudi Days (selection), Indian Thought Publications

REFERENCE BOOKS
- Robe Pope, An Introduction to Language Literature and Culture.Routledge, 2005

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
OBJECTIVES:
1. To learn about different types of grammars used in Compilers
2. To learn about different phases of a Compiler.

Unit I: Introduction

Unit II: Basic Parsing Techniques

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

Error Handling: Detection, Reporting, Recovery and Maintenance, Compiler-Compiler—YACC, Code Generation, Concept of Compiler Design for Object-Oriented Language.

LEARNING OUTCOMES
At the end of course the students will able to learn

CO1. Ability to use Lex for designing lexical analyzers
CO2. Ability to use Yacc for designing syntax Analyzers
CO3. Ability to design parsing tables from grammars
CO4. The student will be able to know the basic knowledge about the construction of Compiler.

Text Books:

Reference Books:
OBJECTIVES: This subject aims to provide the knowledge about pattern recognition & its area of applications.

Unit 1
Introduction to Pattern Recognition, Decision Trees: CART, C4.5, ID3, CHAID, Bayesian Decision Theory, Linear Discriminants Classifiers, Decision Boundary, Separability, Single and Multilayer perceptron, training set and test sets, standardization and normalization

Unit 2
Feature selection, Problem statement and Uses, Probabilistic separability based criterion functions, interclass distance based criterion functions, Branch and bound algorithm, sequential forward/backward selection algorithms, MRMR, FCBF, ReliefF, SVM

Unit 3

Unit 4
Optimization Techniques, Genetic Algorithms, Ant Colony Optimization, Particle Swarm Optimization, Cuckoo Search, Bee colony optimization, Classifier Ensembles, Selection of Classifiers, Bagging, Boosting, AdaBoost, Random Forests, Rotation Forest.

Unit 5
Performance evaluation of classifier, k-fold cross validation, Jacknife and Bootstrap Methods, No Free Lunch Theorem, Ugly Duckling Theorem, Bias-Variance Dilemma, Syntactic Methods, Neural Networks, Deep learning

LEARNING OUTCOMES
Upon the successful completion of the course, students will be able to learn in detail about the following:
CO1. Pattern recognition & discriminants classifiers.
CO2. Different analysis methods & about clustering.
CO3. Various thermos related to optimization.

Text Book

Reference Book
Objective:
This course is designed to provide a comprehensive introduction to computer graphics leading to the ability to understand contemporary terminology, progress, issues, and trends.

1. A thorough introduction to computer graphics techniques, focusing on 3D modelling, image synthesis, and rendering. We will look at raster scan graphics including line and circle drawing, polygon filling, anti-aliasing algorithms, clipping, hidden-line and hidden surface.
2. The interdisciplinary nature of computer graphics is emphasized in the wide variety of examples and applications.

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 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.


Learning Outcomes
After completion of the course the students will able to learn:

CO1. To understand a comprehensive introduction to computer graphics leading to the ability to understand contemporary terminology, progress, issues, and trends.
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)  
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CO2. Explain the thorough introduction to computer graphics techniques, focusing on 2D and 3D modeling, image synthesis, and rendering.

CO3. Expose to the interdisciplinary nature of computer graphics is emphasized in the wide variety of examples and applications.

CO4. Students will be able to develop the projects based on Computer Graphics.

Text Book:

Reference Book:
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML) 
Applicable for Batch: 2019-23

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<th>Subject Code</th>
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<td>Introduction to Big Data Analytics</td>
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OBJECTIVES: The main goal of this course is to help students learn, understand, and practice big data analytics and machine learning approaches, which include the study of modern computing big data technologies and scaling up machine learning techniques focusing on industry applications. Mainly the course objectives are: conceptualization and summarization of big data and machine learning, trivial data versus big data, big data computing technologies, machine learning techniques, and scaling up machine learning approaches.

Unit 1 Introduction
Examples, data science articulated, history and context, technology landscape.  

Unit 2 Data Manipulation at Scale
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
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
Visualization, data products, visual data analytics, Provenance, privacy, ethics, governance.

Unit 5 Special Topics
Graph Analytics: structure, traversals, analytics, PageRank, community detection, recursive queries semantic web.

LEARNING OUTCOMES
The students learning outcomes are designed to specify what the students will be able to perform after completion of the course:
CO1. Ability to identify the characteristics of datasets and compare the trivial data and big data for various applications.
CO2. Ability to select and implement machine learning techniques and computing environment that are suitable for the applications under consideration.
CO3. Ability to solve problems associated with batch learning and online learning, and the big data characteristics such as high dimensionality, dynamically growing data and in particular scalability issues.
CO4. The student will learn about the graph analytics and its application.

Text Book:

Reference Book:
1- Frank J. Olhorst Big Data Analytics: Turning Big Data into Big Money (Wiley and SAS Business Series), 2015

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
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Objectives of the Course:

- The student will learn how the hardware and software components of a microprocessor-based system work together to implement system-level features and integrating digital devices into microprocessor-based systems;
- The student will learn the operating principles of, and gain hands-on experience with, common microprocessor peripherals such as timers, USART, and PPI; role of CPU, registers, and modes of operation of 8085 and 8086 microprocessor.
- Learning Microprocessor instruction sets and learning assembly-programming styles, structured assembly language programming.

UNIT 1: Fundamental of Microprocessor 8085:

UNIT 2: 8085 Architecture:
Register organization, 8085 Microprocessor Architecture, Address, Data and Control Buses, Pin Functions, Demultiplexing of Buses, Generation of Control Signals, Timing diagrams: Instruction Cycle, Machine Cycles, T-States, Concept of Address line and Memory interfacing, Address Decoding and Memory Interfacing.

UNIT 3: Instruction Sets and Fundamentals of Programming:
Classification of Instructions, Addressing Modes, 8085 Instruction Set, Instruction And Data Formats, Writing assembly language programs, Programming techniques: looping, counting and indexing, Stack & Subroutines, Developing Counters And Time Delay Routines, Code Conversion, BCD Arithmetic And 16-Bit Data Operations. The 8085 Interrupts, 8085 vector interrupts.

UNIT 4: Memory and input-output Interfacing:
Memory interfacing, I/O interfacing – memory mapped and peripheral mapped I/O Programmable Interfacing Devices Like 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 Different Modes.

UNIT 5: Introduction to 8086:
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

Reference Books:
1. Microprocessor and Microcontroller fundamentals. The 8085 and 8051 Hardware and Software, William Kleitz

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
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**Outcome of The Course:**
After learning this course students will be able to
- Identify the basic element and functions of microprocessor.
- Describe the architecture of microprocessor and its peripheral devices.
- Demonstrate fundamental understanding on the operation between the microprocessor and its interfacing devices.
- Apply the programming techniques in developing the assembly language program for microprocessor application.
- An ability to design microprocessors based system, components or process as per needs and specifications

**List of Experiments:**
1. To perform 8-bit arithmetic operations between two numbers stored at consecutive memory locations: addition, subtraction, multiplication, division.
2. To perform 16-bit arithmetic operations between two numbers stored at consecutive memory locations: addition, subtraction, multiplication, division.
3. To find the largest and smallest element in an array. Also find the sum of elements in an array.
4. Generation of Fibonacci series in 8085 in hexadecimal sequence.
5. Write and execute the program for finding even and odd numbers.
6. To sort the given number in the ascending and descending order using 8085 microprocessor.
7. Code conversion: decimal number to hexadecimal, hexadecimal number to decimal.
8. To add two 8 bit BCD numbers stored at consecutive memory locations.
9. To subtract two 8 bit BCD numbers stored at consecutive memory locations.
10. To interface programmable peripheral interface 8255 with 8085 and study its characteristics in mode0, mode1 and BSR mode.

**List of value added Experiments:**
1. To interface 8253 Interface board to 8085 mp and verify the operation of 8253 in six different modes.
2. To interface a stepper motor with 8051 microcontroller and operate it.

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OBJECTIVES: in this course students will get the exposure to the origin and formation of digital imaging and will able to develop the understanding of different types of imaging techniques for different applications.

Unit I
Introduction and Fundamentals

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.


Unit IV
Registration:
Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Unit V
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

LEARNING OUTCOMES
At the end of the course students will able to learn
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23

CO1. Ability to enhance image in spatial and frequency domain.
CO2. Ability to implement various aspects of image segmentation and compression.
CO3. Feature extraction & object recognition in an image.
CO4. Students will be able to use the concept of Image Processing for designing real world projects.

Text Book:

Reference Book:

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
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OBJECTIVES:
This course aims to provide the understanding of the algorithms for Routing, Forwarding, Lookup, Resource management in packet switching networks and understand the Internet architecture and router internals.

UNIT I
Network Layer design Issues, IPv4, IPv6, Shortest Path Routing, Distance Vector Routing, Flooding, Hierarchical Routing, Broadcast Routing, Multicast Routing.

UNIT II
Wireless Networks, GSM Architecture, CDMA, Mobility in networks, Handoffs. Mobile IP- IP Packet Delivery, Agent Discovery, Registration, Tunneling and Encapsulation.

UNIT III
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

UNIT V
IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management, SSL.

LEARNING OUTCOMES
At the end of the course the students will able to learn:
CO1. Ability to identify the essential components of networking
CO2. Ability to analyze the algorithms for routing, forwarding, lookup with respect to stability, robustness, scalability, security
CO 3. Ability to analyze the performance of congestion control and resource management techniques
CO4. Ability to carry out further research in recent networking architectures

Text Book:

Reference Book:
OBJECTIVES:
The objective of this Course is to provide the knowledge & necessary skills to develop software.

Unit I

Unit II

Unit III:

Unit IV:

Unit V:

LEARNING OUTCOMES
At the end of the course the students will able to learn
  CO1. Ability to analyze and specify software requirements
  CO2. Ability to apply software engineering principles and techniques to develop large-scale software systems.
  CO3. Ability to plan and work effectively in a team.
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
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Text Book:

Reference Book:

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OBJECTIVES: Students undergoing this course are expected to:
- Introduce the concept of data mining with in detail coverage of basic tasks, metrics, issues, and implication.
- Core topics like classification, clustering and association rules are exhaustively dealt with. And introduce the concept of data warehousing with special emphasis on architecture and design.

Unit I (6 L)
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 Martin. ROLAP, MOLAP, HOLAP.

Unit II (7 L)
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 (7 L)
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 (8 L)
Classification: What is Classification, Issues regarding Classification, Decision tree, Bayesian Classification, Classification by Back propagation.

Unit V (8 L)
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

LEARNING OUTCOMES
At the end of the course the students will able to learn & having
- CO1. Ability to explain the concepts of data warehouse.
- CO2. Analyze OLAP tools and Apply Data mining techniques and methods on large data sets. Compare and contrast classification and prediction techniques.
- CO3. Ability to explain data mining tools on various applications
- Co4. Will able to learn density based methods.

Text Book:
1. Jiawei Han, Micheline Kamber, “Data Mining Concepts & Techniques” Elsevier, 2008

Reference Book:

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
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OBJECTIVES:
The objective of the course is to explain the key concepts of Grid computing and the resource selection for Grid environment.

**UNIT 1** *(6 L)*
Definition of Grid; Basic Building Blocks; Issues in Management of Grid Models; Evolution of Grid Models, Anatomy and Physiology of Grid-Review of Web Services-OGSA-WSRF.

**UNIT 2** *(7 L)*
Fundamental system components of Grid Computing; Requirements concerning abstractions, behaviors, resources, connectivity, and protocols; Open grid service architectures.

**UNIT 3** *(11 L)*
Introduction to Grid computing environment: Overview of GCE; Programming models; Middleware for building grid computing environments; Language support (MPI-G, MPI-G2) for grid computing; Meta models for grid programming; Security.

**UNIT 4** *(6 L)*
Data Management in Grid Computing; Categories and Origins of Structured Data; Data Management Challenges; Architectural Approaches Collective Data Management Services Federation; Services-Grid Portals-First-Generation Grid Portals-Second-Generation Grid Portals.

**UNIT 5** *(6 L)*
Monitoring and evaluation: Monitoring; Scheduling; Performance tuning; Debugging and performance diagnostic issues.

LEARNING OUTCOMES
After this course students will understand the
CO1. key concepts of Grid computing and to identify the resource selection for Grid environment.
CO2. Ability to express and perform data management and transfer in Grid environments.

Text Book:

Reference Book:

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23

<table>
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<tr>
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<th>Subject Title</th>
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COURSE OBJECTIVE:
To understand the basic concepts Entrepreneurship and start up. To understand role and importance of entrepreneurship for economic development. To develop personal creativity and entrepreneurial initiative or start up.

COURSE OUTCOME
At the end of the course the student can:

CO1: Analyse the business environment in order to identify start up opportunities
CO2: Identify the elements of success of entrepreneurial ventures
CO3: Consider the legal and financial conditions for starting a start up
CO4: Evaluate the effectiveness of different entrepreneurial strategies

Unit 1:
4Hrs.

Unit 2:
6Hrs.

Unit 3:
5Hrs.

Unit 4:
5Hrs.

Unit 5:
6Hrs.

TEXT BOOKS:

REFERENCE:

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
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EVALUATION BREAKUP:

- Case study – 25 Marks (Internal)
- Assignments – 10 Marks (Internal)
- Mid Term Evaluation of Project – 10 Marks (Internal)
- Startup Idea, Seminar - 15 Marks (External)
- End Term Evaluation of Project – 40 Marks (External)

*The End Term evaluation will consist of 25 to 30 minutes’ presentation followed by questionnaire by External Experts.

RESOURCE PERSONS FROM VARIOUS DEPARTMENTS:

- Mechanical Engineering
- MBA
- Computer Science Engineering.
- Information Technology.
- Industry Persons.
  1. Experts from Industry – As recommended by STPI
  2. Dr Umakant Panwar – Entrepreneur
  3. Mr Vivek Harinarian - Entrepreneur.
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)

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Course Outline: Aptitude and Soft Skills IV is the final step of programme and the module is designed to enhance the analytical and interpersonal skills of students to make them ready to face various placements, interviews. It will also help them learn various personality development techniques by enhancing their GD and PI skills. Mock Placement Drive will test and improve students by Feedback Sharing & Error Correction.

Course Objective:
1. Align themselves with the placement requirements and their needs
2. Learn analytical and employability skills
3. Prepare students for job placements so that they could clear the selection process successfully and give them strategies and skills to crack GD as well as PI to get selected with decent job offers

Course Pre/Co-requisite (if any):
1. Understanding grammar, number system and basic arithmetic, analytical reasoning concepts, covered in Aptitude and Soft Skills III
2. Professional profile building and Self introduction

Detailed Syllabus

UNIT 1: QUANTITATIVE APTITUDE

02 hours

Partnership
Introduction & types; Speed, Distance and Time: Average Velocity; Race tracks - Straight and Circular; Trains; Boats and Streams.

Time and Work
Basic concepts (relationship between men, days and work); Understanding group efficiency; Alternate work; Negative work; Wages; Pipes and Cisterns.

Permutation and Combination
Basic Principles of Counting (Addition and Multiplication); Arrangements around- Circular, Square and Rectangular tables and in straight lines, circular permutation, selection, distribution.

Probability
Introduction, various types of events; Classical definition of probability; Random and Discrete variables; Bayes’ Theorem and question types.

Data Interpretation
Introduction; Different ways of representing data- Narration based, pictorial, pie chart, Bar graph, line charts; various questions based upon them.

UNIT 2: VERBAL APTITUDE

02 hours

Cloze test
Intricacies of cloze test, correct use of specific adjectives, concept of sentence improvement, writing concept, auxiliaries and modals.

Words
Concept of consistency, precision, concision in terms of reading and writing, advance word choice with respect to placement papers, SAP (Subject-Audience-Purpose) approach.

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Clauses 02 hours
Subordinate Clauses- The noun clause, the adjective clause, the adverb clause, Analysis of simple and complex sentences, prepositional phrases, transformation of sentences.

Vocabulary 01 hour
Revisiting vocabulary- high, medium and low frequency words, organization of ideas an thoughts in order to understand the text- The Pyramid Principle.

Questions 02 hours
Various test taking skills in accordance with the placement papers.

UNIT 3: LOGICAL REASONING 11 HOURS

Deductive Logic 03 hours
Premises and conclusion structure, Quality of deductive argument, Categorical arguments, Syllogism, Conditional Arguments- If..then, only if..then, If and only if , Either or.

Puzzles 02 hours
Grouping and selection, Double line up, Binary logic- truth teller-lie teller, Team formation and miscellaneous puzzles.

Set Theory and Critical Reasoning-II 03 hours
Union and Intersection of sets, Use of venn diagrams in problem solving with two, three, four set, concept of maxima-minima through Venn diagram.

Critical reasoning II: Statement and Inference, cause and Effects, Statement and Arguments- Strengthen or Weaken the argument, Statement Assertion and Reason.

Non-Verbal Reasoning 01 hour
Mirror-image, Water-image, Spotting out the embedded figures, Completion of incomplete pattern, Figure matrix, Paper folding, Paper cutting, Grouping of identical figures, Counting figures, Non verbal series / analogies / odd man out.

Data Sufficiency 02 hours
Data Sufficiency based on logical reasoning field like Coding-Decoding / Puzzle Test / Blood Relations / Mathematical calculations / clock / calendar / etc.

UNIT 4: SOFT SKILLS 08 HOURS

Group Discussion 04 hours
Importance, Do’s & Don’ts, Personality Traits, Tips and Strategies, Types of Group Discussions.

Suggested Exercises, Games & Activities: Mock Group Discussions (on basic topics), with feedback sharing and error analysis.

Personal Interview 04 hours
Importance, Do’s & Don’ts, Personality Interview, Tips and Strategies, Etiquette Rules.

Suggested Exercises, Games & Activities: Mock Personal Interviews (contd.) with feedback sharing and error analysis.

Learning Outcomes:

By the end of this semester, students will:
1. Be prepared for the upcoming placements and they will also be ready for other competitive exams.

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2. Improve their GD and PI Skills and be able to have firsthand experience of a Placement drive and gain sufficient confidence to perform well.

Text book [TB]:


Reference books [RB]:

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OBJECTIVES: The objective of this course is to develop a broad perspective about the applicability of ML algorithms in different fields and understand the major ML algorithms, the problem settings, and assumptions that underlies them.

Unit 1: Introduction to Data Science and Machine Learning


Unit II: R Objects: Data Handling

Introduction to R, why R? Object, Vector, List, Factor, Matrix, Array, Data Frame, Manipulating Objects, Input/Output, R constructs

UNIT III: Descriptive Statistics

Central tendency – , Dispersion – variance, standard deviation, shape – skewness, kurtosis, percentiles, five point summary, boxplots, histograms, bar plot, pie chart, scatter plot, two way tables, covariance, correlation, Chi-Square test for two way tables

Unit IV: Unsupervised Learning - Clustering

What is Clustering? Applications of Clustering, Similarity measures, – K means clustering.

Supervised Learning: Regression, Classification

What is Regression? Simple Linear Regression, Multiple Linear Regression, What is Classification? Logistic Regression, Decision Tree, k-Nearest Neighbors, Support Vector Machine

Unit V: Neural Networks

Introduction to Neural Networks, Activation functions, Learning rate, Stochastic Gradient Descent, Feed forward, Back propagation, Basics of Deep Learning Networks

Hands-On Projects using R

Data Description, Data Visualization, Correlation analysis, Clustering, Regression, Classification, Neural networks.

LEARNING OUTCOMES

The student will be able to:

CO1. Identify the machine learning algorithms which are more appropriate for various types of learning tasks in various domains.

CO2. Implement machine learning algorithms on real datasets.

CO3. The student will learn about the basic concepts of Deep Learning.

CO4. To develop the projects using language R

TextBooks:

1. Practical Data Science with R. Author(s): Nina Zumel, John Mount, Manning Shelter Island, 2014

Reference Books:

1. Introduction to Data Mining. Author(s): Pang-Ning Tan, Steinberg, Vipin Kumar, 2016
2. Introduction to Statistical Learning using R. Author(s): Trevor Hastie, Tibshirani, 2016

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OBJECTIVES: The objective of this course is to introduce the students statistical machine learning and different models associated with them.

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.

LEARNING OUTCOMES
At the end of the course students will able to learn about
CO1. Parametric & non- parametric methods used in learning
CO2. Graphical & hybrid models in machine learning

Text Book

Reference Book

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OBJECTIVES: The objective of this course is to give the knowledge of neural of network and its applications to perspective students.

Unit I (8 L)

Unit II (7 L)
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 (8 L)

Unit IV (8 L)

Unit V (8 L)
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).

LEARNING OUTCOMES
At the end of the course students will able to learn about
CO1. Decision Tree learning.
CO2. Inductive & analytical learning.

Text Book

Reference Book
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OBJECTIVES:
The objective of this course is to give the knowledge & understanding about different architectures of computers & its evaluation of their performance.

UNIT 1 (6L)

UNIT 2 (8L)

UNIT 3 (8L)

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 (8L)
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.

LEARNING OUTCOMES

CO1. Ability to identify the basic components and design of a computer, including CPU, memories, and input/output units
CO2. Ability to identify the issues involved in the instruction execution and various stages of instruction life stage
CO3. Ability to identify the issues related to performance improvement
CO4. Ability to distinguish performance tradeoff between different memory units and instruction sets

Text Book:

Reference Book:

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<th>Subject Code</th>
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OBJECTIVES:
The objective of the course to provide the knowledge to students about components of managing and monitoring the data center and define information security and identify different storage virtualization technologies.

UNIT-I
Introduction to Storage Technology: Data creation and The value of data to a business, Information Lifecycle, Challenges in data storage and data management, Solutions available for data storage, Core elements of a Data Center infrastructure, role of each element in supporting business activities.

UNIT-II
Storage Systems Architecture: Hardware and software components of the host environment, Key protocols and concepts used by each component, Physical and logical components of a connectivity environment, Major physical components of a disk drive and their function, logical constructs of a physical disk, access characteristics, and performance Implications, Concept of RAID and its components, Different RAID levels and their suitability for different application environments: RAID 0, RAID 1, RAID 3, RAID 4, RAID 5, RAID 0+1, RAID 1+0, RAID 6, Integrated and Modular storage systems, high-level architecture and working of an intelligent storage system.

UNIT-III
Introduction to Networked Storage: Evolution of networked storage, Architecture, components, and topologies of FC-SAN, NAS, and IP-SAN, Benefits of the different networked storage options, Understand the need for long-term archiving solutions and describe how CAS fulfill the need, Understand the appropriateness of the different networked storage options for different application environments.

UNIT-IV
Information Availability, Monitoring & Managing Data Center: Reasons for planned/unplanned outages and the impact of downtime, Impact of downtime. Differentiate between business continuity (BC) and disaster recovery (DR), RTO and RPO, Identification of single points of failure in a storage infrastructure and solutions to mitigate these failures, Architecture of backup/recovery and the different backup/recovery topologies, replication technologies and their role in ensuring information availability and business continuity, Remote replication technologies and their role in providing disaster recovery and business continuity capabilities. Key areas to monitor in a data center, Industry standards for data center monitoring and management, Key metrics to monitor storage infrastructure.

UNIT-V

LEARNING OUTCOMES
- CO1. Explain the data storage technologies and storage system environment.
- CO2. Discuss about different network storage and content addressed storage.
- CO3. Apply the RAID concepts for data protection and explain the working of intelligent storage system.
- CO4. Describe the storage virtualization techniques and Information Availability & Monitoring & Managing Datacenter.
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Text Books:

Reference Books:

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**Applicable for Batch: 2019-23**

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<td>Parallel Computing</td>
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**OBJECTIVES:** Students undergoing this course are expected to learn different parallel programming models along with the technologies that enabling parallel computing

**Unit-1**  
**Introduction**
Why parallel computing? Shared memory and distributed memory parallelism, Amdahl’s law, speedup and efficiency, supercomputers.

**Unit-2**  
**Message passing**
MPI basics, point-to-point communication, collective communication, synchronous/asynchronous send/receive, algorithms for gather, scatter, broadcast, reduce.

**Unit-3**  
**Parallel communication**
Network topologies, network evaluation metrics, communication cost, routing in interconnection networks, static and adaptive routing, process-to-processor mapping.

**Unit-4**  
**Performance, Designing Parallel codes**
Scalability, benchmarking, performance modeling, impact of network topologies, parallel code analysis and profiling.
Domain decomposition, communication-to-computation ratio, load balancing, adaptivity.

**Unit-5**  
**Parallel I/O**
MPI I/O algorithms, contemporary large-scale I/O architecture, I/O bottlenecks.
RDMA, extreme scale computing: issues and trends.

**LEARNING OUTCOMES**
- CO1. Ability to explain the different types of interconnection networks.
- CO2. Ability to demonstrate the concepts Parallel Algorithms
- CO3. Ability to demonstrate the concepts of Shared memory Based parallel Computers
- CO4. Ability to demonstrate different parallel programming models

**Text Book:**

**Reference Book:**

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**Humanities Electives III**

**Course Objective**
- To develop a broad base of knowledge in the various domains of psychology and its applications.
- To Synthesis and demonstrate of useful skills in the field of psychology namely areas of organization, society, stress management etc.

**Unit 1 Role of Psychology in Understanding the Self**
Three Stages – Self awareness, Self acceptance and Self realization; Exploration through JOHARI Window; Development of Self-Mead & Cooley

**Unit 2 Application of Psychology at Work Place**
Work Motivation: Theories and applications: Maslow, Herzberg, Goal Setting, Emotion: Emotional Quotient & Job Satisfaction, Early approaches to leadership, contemporary approaches to leadership-Transformational & Transactional Leadership, styles of leadership

**Unit 3 Application of Psychology in Personal & Professional Excellence**
Achieving Success: Creativity & Innovation; Role of attitude; Role of competence; Role of Self-confidence; Time management; Role of Human Values

**Unit 4 Role of Psychology in Health & Fitness**
Stress & Coping Strategies: Meaning, Types, Sources, Effects of stress on health, and coping strategies; Characteristics of a healthy personality

**COURSE OUTCOME:**
- The students will be able to understand basic concepts of psychology in major domains.
- The students will be able to apply the fundamentals of psychology in order to solve real life problems.
- The students will Use scientific reasoning to interpret psychological phenomena.
- To apply ethical standards to evaluate psychological science and practice

**TEXT BOOKS**

**REFERENCE BOOKS**
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Humanities Electives III

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Course Objective

- To provide the basic understanding of intellectual property rights, the rationale behind making provision for these rights and the recent concerns in the field.
- To increase the attention of students to protect their IP though legal provision and also they can reduce the imitation rate.
- To increase the understanding of students to get their involvement in technology transfer and commercialization

Unit 1 Introduction of IP
5Hrs.
Public Funded Research and Its Implications in an Economy; Public Funded Research and Economic Development; Research & Development and Industrial Development

Unit 2 Historical Perspectives of IPRs
4Hrs.
History and concept of Property; Introduction to intellectual property rights (IPRs); Patent, Industrial design; Copyrights, Trademarks, Geographical Indications; Trade Secrets; International aspect of IPRs; Development at International level regarding IPRs

Unit 3 Polices on IPRs in India
10 Hrs.
The debate: Copyright vs Copy left; Research ethics; role of IPRs in economic development in developed and developing economies; Overview of Various Policies on IPRs in India; Success Story of Bayh Dole Act of IPRs in USA

Unit 4 IPRs and Technology Commercialization
7Hrs.
Technology Transfer and Commercialization; Key Determinants and Participants of Technology Transfer and Commercialization; Types of Technology Transfer and Commercialization; Technology Transfer and Commercialization in India and Other Developing Economies

COURSE OUTCOME

- The students will be able to understand the importance of IPRs in academic field.
- The student gets idea how they can protect their IP through IPRs regime.
- The student gets more incentive towards technology transfer and commercialization
- Apply intellectual property law principles (including copyright, patents, designs and trademarks) to real problems and analyse the social impact of intellectual property law and policy

TEXT BOOKS


Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23


REFERENCE WORK

Human Values

Unit 1 INTRODUCTION
5Hrs.
Nature of Value-Crisis in the contemporary Indian society, Meaning, Nature & Types of Values; Sources of Value Formation, Foundational Human Values – Integrity, Freedom, Creativity, Morals, Love and Wisdom, Case Studies
Case Studies on the above aspects

Unit 2 SOCIETAL VALUES & MATERIAL VALUES
6Hrs.
Case Studies on the above aspects

Unit 3 PSYCHOLOGICAL & SPIRITUAL VALUES
7Hrs.
Humanistic Psychology; Concept of Intelligence, Emotional Intelligence& Mental health; Cognitive Dissonance & Ego Defense, Maslow’s Hierarchy of Human Need; Characteristics of ‘Self-Actualizing’ persons; Understanding Common Religion & Concept of Dharma and Spirituality; Case Studies
Case Studies on the above aspects

Unit 4 PSYCHOLOGICAL & SPIRITUAL VALUES
8Hrs.
Bases for moral Judgments: Customary Morality, Religious Morality, Reflective Morality. Concept of Professional values: Competence , Confidence , Devotion to Duty, Efficiency , Accountability , Respect for learning / Learned , Willingness to Learn, Open and Balanced mind; Team spirit ; Willingness for Discussion, Aims, Effort , Avoidance of Procrastination and Slothfulness, Alertness, IEEE; Case Studies
Case Studies on the above aspects

COURSE OUTCOME
• Students are expected to become more aware of their self and their relationships and would have better reflective and discerning ability.
• They would also become more sensitive to their surroundings including both people and nature, with commitment towards what they believe in (human values).
• To understand how universal values can be uncovered by different means, including scientific investigation, historical research, or public debate and deliberation (what some philosophers call a dialectic method)
• To understand and discuss the idea of moral relativism and the challenges it poses to universal values

TEXT BOOK
Human Values - Prof. A.N.Tripathi New Age International, 2009

REFERENCE BOOK
Human Values and Professional Ethics - Jayshree, Suresh and B.S. Raghwan , S. Chand Publication, 2011-12
Course Objective

- The course will enable the students to understand the level of Indian English Literature.
- It will also enable the students to understand different genres such as prose, poetry, and fiction in Indian Writers in English.

Unit 1

Prose
APJ Abdul Kalam: Unity of Minds
Mahatma Gandhi: Hind Swaraj What is Civilization? (Chapter XIII) Education (Chapter XVIII)
Swami Vivekananda: The Cosmos-Macrocosm

Unit II

Poetry
Rabindranath Tagore: Geetanjali – Where the mind is without fear
Kamla Das: An Introduction
Nissim Ezekiel: The Night of Scorpion
Sarojani Naidu: Life
Toru Dutt: Our Casuarina Tree
Sri Arbindo: Stone Goddess

Unit III

Short Stories
R.N.Tagore: Kabuliwala
R.K. Narayan: An Astrologer’s Day
Mulk Raj Anand: Duty
Nayantara Sehgal: Martand

Unit IV

Novel
Ruskin Bond: Flights of Pigeons

Course Outcome:

- The students will develop an insight into Indian literature.
- The students will learn to appreciate different genres of literature of Indian Literature in English.
- The students will understand the role of literature in reflecting the social context and the shaping of a young nation.
- The students will demonstrate knowledge and comprehension of major texts and traditions of language and literature written in English as well as their social, cultural, theoretical, and historical contexts.

Text Books

- Kumar, Shiv K. (ed), Contemporary Indian Short Stories in English, 2007 SahityaAkademi
- Anand, Mulk Raj; SarosCowasjee (ed.); Selected Short StoriesPenguin Books, 2006

Reference Books

Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Title</th>
<th>Basics of Data Science</th>
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</thead>
<tbody>
<tr>
<td>IT353</td>
<td>300</td>
<td>3</td>
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</tbody>
</table>

Course Objective:

1. The objective of the course is to make the students understand the different techniques for efficient mining of the data.
2. To introduce students to the concepts, processes and practice of Inference Rules at different abstraction levels of Data.
3. To provide an understanding of the Data management perspective regarding the use of business intelligence (BI), Data Mining systems and Advanced Applications.

Detailed Syllabus

UNIT 1

Data Science: Introduction to Data Science, Overview, Motivation, 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.

UNIT 2

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.
Data objects and attribute types, Measuring Data Similarity and Dissimilarity, Cosine Similarity.

UNIT 3

Concept Description: Definition, Data Generalization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases. Measuring Central Tendency, Box Plots, Measuring Dispersion of Data, Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases, FP-growth algorithm.

UNIT 4

Classification: What is Classification, Issues regarding Classification, Attribute selection measures, Information Gain, Gain Ratio, Gini Index, Decision tree, Naïve Bayesian Classification, Metrics for evaluating classifier performance, Confusion matrix.

UNIT 5


Learning Outcome

The course provides the students the ability to:
1. Undertake systematic investigation/research related to the Data mining Concepts
2. Understand advanced Database systems and technologies for today’s dynamic business environment.

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Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
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Text book [TB]:
1. Jiawei Han, MichelineKamber, ”Data Mining Concepts & Techniques” Elsevier.

Reference books [RB]:
1. M.H.Dunham,”DataMining :Introductory and Advanced Topics” Pearson Education

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
Course Objective:
1. To make students learn about basic understanding of the multimedia objects and tools for object generation
2. To teach students audio and video file formats used now days as a part of IT generation.
3. To make students learn clear understanding of multimedia projects.
4. To make students learn different compression techniques.

Detailed Syllabus

UNIT 1

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

Multimedia Building Blocks: Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture.

UNIT 3

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

Image, Audio and Video Compression: Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression, lossy graphic compression, image file format, 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

Advanced forms of interaction in Multimedia: Video Conferencing, Elements of (immersive/non-immersive) Virtual Reality, Augmented Reality, Tele presence, Mobile technologies.


Learning Outcome
At the end of the course, Learning Outcomes Having successfully completed this course, the student will demonstrate:
1. Students will understand various multimedia tools available.
2. Students will be able to learn with Multimedia projects.
3. Students can differentiate between lossy and lossless compression.

Text Book [TB]:

Reference Book [RB]:
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Title</th>
<th>Consumer Electronics</th>
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<tbody>
<tr>
<td>EC383</td>
<td>LTP 3 0 0</td>
<td>Credit 3</td>
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</tbody>
</table>

Objectives of the Course: The students will learn

- Consumer Electronics and its application
- Concept of audio and video related system.
- Concepts of recording and power supplies.

UNIT-I
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
Video Systems and Displays: Monochrome TV, Colour TV standards and systems, TFT, Plasma, HDTV, Digital TV, Video Telephone and Video Conferencing

UNIT III:
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:
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
Power Supplies and other systems: SMPS, UPS and Preventive Maintenance, Set Top Boxes, Remote controls, Bar codes, ATM

Text Books:

OUTCOMES OF THE COURSE:
The course provides an understanding of:

- Electronic systems related to consumer applications.
- Principle of working of various home appliances.
- Skills to use modern consumer electronics systems used in day to day life.
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>EC385</th>
<th>Subject Title</th>
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<td>Semester VII</td>
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</table>

Objectives of the Course: To teach the fundamental concepts of various electronic devices, circuits and their application. To develop ability among students for problem formulation, system design and solving skills.

UNIT-I

Semiconductor materials and properties Group-IV materials, Covalent bond, electron-hole concepts Basic concepts of energy bands in materials, concepts of forbidden gap Intrinsic and extrinsic semiconductors, donors and acceptors impurities 4L

UNIT-II

Junction diode and diode applications p-n junction, depletion layer, v- i characteristics, diode resistance, capacitance diode ratings (average current, repetitive peak current, non-repetitive current, peak-inverse voltage). 4L

Diode Applications Rectifiers (half wave and full wave), filter (C – filter), clipping circuits, clamping circuits, voltage multipliers 4L

UNIT-III

Breakdown diodes Breakdown mechanisms (zener and avalanche), breakdown characteristics, zener diode application as shunt regulator 4L

UNIT-IV

Bipolar Junction Transistor Basic construction, transistor action, CB, CE and CC configurations, input/output Characteristics, Transistor Amplifier Graphical analysis of CE amplifier, concept of voltage gain, current gain. 6L

UNIT-V

Field Effect Transistor

JFET: Basic construction, transistor action, concept of pinch off, maximum drain saturation current, input and transfer characteristics, characteristics equation CG, CS and CD configurations,

MOSFFT: depletion and enhancement type MOSFET-construction, operation and characteristics. 6L

Reference Books:


Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
**Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)**

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**OUTCOME OF THE COURSE:**

- Students will be able to build, develop, model, and analyze the electronic circuits along with learning the device ratings and characteristics
- Students will be able to design and analyze electronic circuits

**List of Experiments:**

1. To study V-I characteristics of p-n junction diode.
2. To study V-I characteristics of zener diode.
3. To study half-wave rectifier and calculate ripple factor and efficiency.
4. To study full-wave rectifier and calculate ripple factor and efficiency.
5. To study clipper circuits.
6. To study clamper circuits.
7. To study the input and output characteristics of CB and CE transistor.
8. To study drain and transfer characteristics of JFET.
## Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
### Applicable for Batch: 2019-23

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Title</th>
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<th>Credit</th>
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<th>Year</th>
<th>Semester</th>
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<tr>
<td>EE481</td>
<td>NEW AND RENEWABLE ENERGY SOURCES</td>
<td>3 0 0</td>
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<td>4th</td>
<td>VII</td>
</tr>
</tbody>
</table>

### Objectives of the Course
- To introduce fundamentals of various renewable energy source
- To introduce fundamentals of technologies used to harness usable energy from solar, wind,
- To introduce fundamentals of technologies used to harness usable energy from ocean and Biomass energy sources.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Subject Title</th>
<th>LTP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 1</td>
<td>Introduction: Energy resources and their classification, oil crisis of late 20th century and its impacts on energy planning, consumption trend of primary energy sources, world energy future, energy audit and energy conservation, energy storage.</td>
<td>8L</td>
</tr>
<tr>
<td>Unit 2</td>
<td>Solar Energy Conversion: Solar resources, passage through atmosphere, solar thermal energy conversion: solar energy collectors, solar thermal power plant, solar PV cell, V-I characteristics, MPPT, Solar PV power plant and applications.</td>
<td>8L</td>
</tr>
<tr>
<td>Unit 3</td>
<td>Biomass Energy Conversion: Usable forms of Bio Mass, Biomass energy resources, biomass energy conversion technologies, ethanol blended petrol and diesel, biogas plants. Energy farming.</td>
<td>8L</td>
</tr>
<tr>
<td>Unit 4</td>
<td>Wind Energy Conversion: Wind Power: Energy estimation, Power extraction, lift and drag forces, horizontal axis wind turbine, vertical axis wind turbine, wind energy conversion and control schemes, environmental aspects.</td>
<td>8L</td>
</tr>
<tr>
<td>Unit 5</td>
<td>Other Alternate Energy Sources/Technologies: Geothermal Energy: geothermal fields, types, geothermal energy generation systems, ocean tidal energy systems, fuel cell: basic operation and classification, principle of MHD generation, output voltage and power, environmental aspects.</td>
<td>8L</td>
</tr>
</tbody>
</table>

### Text Books:

### Reference Books

### Outcome of the Course:
- Identify renewable energy sources.
- Understand the mechanism of solar, wind and ocean energy sources.
- Demonstrate the understanding of various technologies involved in power generation from renewable energy sources.
Course Objective: To enable the students, know and understand the mechanical behavior of composite materials

Course Pre/Co-requisite (if any): Strength of Materials, Materials Engineering

Detailed Syllabus

UNIT 1:
Definition and applications of composite materials, classifications, Fibers- glass, carbon, ceramic and aramid fibers. Matrices- polymer, graphite, ceramic and metal matrices; characteristics of fibers and matrices. Fillers and whiskers. Advantages and limitations of composites

UNIT 2:
Mechanical behaviour of composite materials, surface treatment of fibers, thermosets matrix materials, Thermoplastics and other matrix materials, Manufacturing of thermoset composites, bag moulding, compression moulding, pultrusion, filament welding, other manufacturing processes

UNIT 3:

UNIT 4:
Analysis of laminated composites, symmetric laminates, angle ply laminates, cross ply laminates, laminate, evaluation of lamina properties, determination of stress and strain in laminate, maximum stress and strain criteria, von Mises Yield criterion for isotropic materials

UNIT 5:
Residual stresses during curing, prediction of laminate failure, thermal analysis of composite laminates. Analysis of laminated plates - equilibrium equations of motion, static bending analysis, buckling analysis, free vibrations, natural frequencies.

Learning Outcome

At the end of the course the student can:
CO1:Have an overview of the mechanical behaviour and application of composite materials.
CO2:Get an overview of the methods of manufacturing composite materials
CO3: students will understand various mechanics of composite materials.

Text book [TB]:

Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)  
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Reference books [RB]:

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Title</th>
<th>Total Quality Management</th>
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<tbody>
<tr>
<td>ME44S</td>
<td></td>
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<tr>
<td>LTP</td>
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<tr>
<td>Credit</td>
<td>3</td>
<td>DE/OE</td>
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<tr>
<td>Subject Category</td>
<td>Year</td>
<td>Semester</td>
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<td></td>
<td>4th</td>
<td>VII</td>
</tr>
</tbody>
</table>

Course Objective: To facilitate the understanding of total quality management principles and processes.

Course Pre/Co-requisite (if any): Manufacturing Process, Industrial Engineering and Management

Detailed Syllabus

UNIT 1:
Introduction, need for quality, evolution of quality; Definitions of quality, product quality and service quality; Basic concepts of TQM, TQM framework, contributions of Deming, Juran and Crosby. Barriers to TQM; Quality statements, customer focus, customer orientation & satisfaction, customer complaints, customer retention; costs to quality.

UNIT 2:
TQM principles; leadership, strategic quality planning; Quality councils- employee involvement, motivation; Empowerment; Team and Teamwork; Quality circles, recognition and reward, performance appraisal; Continuous process improvement; PDCE cycle, 5S, Kaizen; Supplier partnership, Partnering, Supplier rating & selection.

UNIT 3:
The seven traditional tools of quality; New management tools; Six sigma- concepts, methodology, applications to manufacturing, service sector including IT, Bench marking process; FMEA- stages, types.

UNIT 4:
TQM tools and techniques, control charts, process capability, concepts of six sigma, Quality Function Development (QFD), Taguchi quality loss function; TPM- concepts, improvement needs, performance measures.

UNIT 5:
Quality systems, need for ISO 9000, ISO 9001-9008; Quality system- elements, documentation, Quality auditing, QS 9000, ISO 14000- concepts, requirements and benefits; TQM implementation in manufacturing and service sectors.

Learning Outcome

At the end of the course the student can:
CO1: To facilitate the understanding of total quality management principles and processes.
CO2: Student will learn about ISO systems
CO3: Student will learn about various quality tools to improve products quality.

Text book [TB]:

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
REFERENCES [RB]:

Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
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<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Title</th>
<th>Fuel Technology</th>
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<tbody>
<tr>
<td>PE481</td>
<td>3 0 0</td>
<td>DE/OE Year 4th Semester VII</td>
</tr>
</tbody>
</table>

1. **Course Summary**
   This course will introduce students to classification of fuel and their properties. In this course, students unable to understand coal preparation, coal storage process, coal gasification process. This course also covers various topics which includes Fischer Tropsch Synthesis, Gaseous and liquid fuels i.e. natural gas, producer gas, water gas, coal gas, biogas, LPG, kerosene, diesel. Students will also learn combustion mechanism for solid, liquid and gaseous fuel.

2. **Course Objectives**
The students should be able to:
1. Understand different types of fuel, basic terms in fuels and combustion
2. Understand the coal preparation and conversion of coal into suitable products using gasification and Fishers Tropsch Synthesis process.
3. Understand physical and chemicals properties of different types of fuel and their storage techniques, combustion mechanism

4. **Course Outcomes**
   A good knowledge of this course will enable students to:
   1. Understand origin of different of types of fuel and their properties and classification
   2. Understand the Coal preparation and storage techniques, Physical and chemical properties of coal, Briquetting and liquefaction of solid fuels
   3. Understand the conversion of coal into useful products using gasification techniques and Fischer Tropsch Synthesis
   4. Understand about gaseous and liquid fuels, their physical and chemical properties and Testing methods for these fuels
   5. Understand about combustion mechanism for different types of fuels and Furnace elements.

4. **Curriculum Content**
   **UNIT 1**

   **UNIT 2**

   **UNIT 3**

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
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UNIT 4

UNIT 5

Text book [TB]:

Reference books [RB]:

5. Teaching and Learning Strategy
All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details.
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<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Title</th>
<th>Health Safety and Environment in Industry</th>
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<tbody>
<tr>
<td>PE482</td>
<td>LTP</td>
<td>3 0 0</td>
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</table>

1. **Course Summary**
   The course will introduce students to the need and scope of health, safety and environment in industry. The students will learn about the sources and causes of pollution, effects of the pollutants on livings and environment, and the safety and remedial measures that should be adopted to reduce the pollution.

2. **Course Objectives**
   The students should be able to:
   1. Understand the sources of pollutions.
   2. Understand the effects of pollutions on health and environment.
   3. Understand the remedial measures and safety precautions associated with each source of pollution.

3. **Course Outcomes**
   On successful completion of the course, students have the understanding of the following:
   1. Understand the scope of HSE in industry.
   2. Understand the sources, effects and remedies of air pollution.
   3. Understand the sources, effects and remedies of water pollution.
   4. Understand the sources, effects and remedies of liquid and solid wastes.
   5. Understand the sources, effects and remedies of noise pollution.

4. **Curriculum Content**

   **UNIT 1**
   Introduction: Man And Environment: Overview (Socio-Economic Structure & Occupational Exposures); Scope Of Environmental Engineering; Pollution Problems Due To Urbanization & Industrialization.

   **UNIT 2**
   Air Pollution : Causes Of Air Pollution; Types & Sources Of Air Pollutants; Climatic & Meteorological Effect On Air Pollution Concentration; Formation Of Smog And Fumigation; Analysis Of Air Pollutants Collection Of Gaseous Air Pollutants; Collection Of Particulate Pollutants; Analysis Of Air Pollutants Like: Sulphur Dioxide, Nitrogen Oxide, Carbon Monoxide, Oxidants &Ozone; Hydrocarbons; Particulate Matter; Control Of Particulate Emission- Control Of Gaseous Emission; Flue Gas Treatment Methods : Stacks Gravitational And Inertial Separation; Settling Chambers; Dynamic Separators; Cyclone; Filtration; Liquid Scrubbing; Spray Chambers; Packed Towers; Orifice And Venturi Scrubbers; Electrostatic Precipitators.

   **UNIT 3**
   Water Pollution & Its Control - Origin Of Waste Water – Types Of Water Pollutants And Their Effects ; Adverse Effects On: Human Health & Environment; Aquatic Life; Animal Life; Plant Life; Water Pollution Measurement Techniques; Water Pollution Control Equipments & Instruments; Indian Standards For Water Pollution Control.

   **UNIT 4**
   Liquid & Solid Wastes – Domestic & Industrial Wastes; Pesticides; Toxic: Inorganic & Organic Pollutants; Soil Deterioration; Ground Water Pollution; Concentration Of Infecting Agents In Soil; Solid Waste Disposal; Dumping Domestic & Industrial Solid Wastes; Advantages & Disadvantages; Incineration- Advantages & Disadvantages – Sanitary Land Field: Advantages & Disadvantages; Management Of Careful & Sanitary Disposal Of Solid Wastes.

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
UNIT 5
Noise Pollution & Control: Intensity; Duration; Types Of Industrial Noise; Ill Effects Of Noise; Noise Measuring & Control; Permissible Noise Limits.

Text book [TB]:
1. J. Turk & A. Turk, “Environmental Science Environmental Pollution”.

Reference books [RB]:

5. Teaching and Learning Strategy
All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details.
**Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)**

**Applicable for Batch: 2019-23**

<table>
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<th>Subject Code</th>
<th>Subject Title</th>
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<td>MA541</td>
<td>Open Elective</td>
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<td>3 0 0</td>
<td>3</td>
<td>4th</td>
<td>VII</td>
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</table>

**OBJECTIVE:** The objective of this subject is to give the basic knowledge of descriptive and mathematical part of statistics. Applications of various probability distribution in the field of insurance and finance. The course will focus on the different situations in the field of actuarial science which can be dealt with transformation of variables. The course will make able the students to understand the association between two random quantities and to find their mathematical measure.

**Unit I**


**Unit II**

Bivariate data: Definition, scatter diagram, simple, partial and multiple correlation, rank correlation. Simple linear regression.

**Unit III**

Principle of least squares and fitting of polynomials and exponential curves. Theory of attributes Independence and association of attributes, consistency of data, measures of association and contingency, Yule’s coefficient of colligation.

**Unit IV**

Testing of hypothesis: Z-test, t-test, F-test, Chi-square test for goodness of fit, Introduction to analysis of variance.

**LEARNING OUTCOME:** Students will able to:

- Analyze given statistical data.
- Have confidence to deal with real life situation, especially, in insurance and finance.
- Understand applications of standard probability distributions in every span of life.
- Find the association between two random quantities using mathematical theory.

**Text Books:**


**Reference Books:**

Course Objective:
To introduce the various aspects of graphics design and important stages of product design and development.

Unit 1: Introduction

Unit 2: Product Design Cycle
Stages of product development. Introduction to ergonomics.

Unit 3: Design Process

Unit 4: Technology & Market Assessment
Customer needs identification, Market research essentials. Advertising and marketing tools.

Unit 5: Design Tools
Introduction to various design tools.

LEARNING OUTCOME:
1. The student will be able to understand the importance of Graphics.
2. The students will be able to understand and demonstrate their ideas visually.
3. The students will be able to understand the various stages of product development.

Text Books:
1. The Elements of Graphic Design, Alex W. White
2. The Design of Everyday Things, Don Norman

Reference Books:
1. Product Design & Development, Karl T. Ulrich & Steven D. Eppinger
OBJECTIVES: The objective of this course is to give the understanding the advanced concepts of database management system and its applications, data modeling, database design, and query languages and query optimizations.

Unit I (8 L)

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)


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-Concurreny in OODBs-Storage and Access Data Access.

Unit V (7 L)

LEARNING OUTCOMES
At the end of the course students will learn
CO1. Ability to apply different data modeling methods in requirement analysis, design, and implementation of database system.
CO2. Ability to apply the normal forms for efficient designing of relational database
CO3. Ability to use appropriate storage and access structures
CO4. Ability to use techniques for transaction management, concurrency control, and recovery

Text Book:

Reference Book:
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23

<table>
<thead>
<tr>
<th>Subject Code</th>
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<td>CS442</td>
<td>CRYPTOGRAPHY AND NETWORK SECURITY</td>
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</table>

OBJECTIVES:
Students undergoing this course are expected to learn fundamentals and advanced concepts of cryptography and its application to network security, security services, and firewalls & threats.

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:

Unit IV:
Authentication Applications: Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), S/MIME.

Unit V:


System Security: Intruders, Viruses and related threats, firewall design principals, trusted systems.

LEARNING OUTCOMES
After completing the course the students have knowledge

Co1. To compare various Cryptographic Techniques

Co2. Demonstrate various data encryption techniques

Co3. Explain the various Security Application

Co4. Students will learn about use and application of cryptography on networks.

Text Book:

Reference Book:

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23

<table>
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<th>Subject Code</th>
<th>Subject Title</th>
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Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019

OBJECTIVES:
The objective of this course is to provide the necessary knowledge and understanding the concepts of Oracle architecture components along with the overview of Storage Structure and Relationships

UNIT I  Introduction  
(8 L)
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  
(9 L)

UNIT III  Managing Oracle  
(9 L)
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

Database Troubleshooting
One Time Troubleshooting, Adhoc Troubleshooting, Escalations, Connectivity, Business Continuity, High Availability and Scalability, Data Sharing and information Integration

LEARNING OUTCOMES
After the completion of course, students will have skill to
1. CO1. Explain the concepts of Oracle architecture components.
2. CO2. Explain the overview of Storage Structure and Relationships
3. CO3. Illustration of the concepts of Managing Process in Databases

Text Book:

Reference Book:
OBJECTIVES:
This course aims to give the students about the knowledge & various applications of information security in the area of computer science.

UNIT I
Introduction: Security problem in computing, Secure system characteristics, what to secure – How to secure- at what cost?
Elementary Cryptography – DES – AES – Public Key Encryption – Uses of Encryption

UNIT II

UNIT III

LEARNING OUTCOMES
At the end of the students shall able to learn about:
CO1. Identify and explain symmetric algorithms for encryption-based security of information.
CO2. Identify and explain public-key based asymmetric algorithms for encryption-based security of information.
CO3. Examine the issues related to administration security, physical security, and program security.

Text Book:

Reference Book:
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23

<table>
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<tr>
<th>Subject Code</th>
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**OBJECTIVES:**
The objectives of this course is to get the exposure to students about computer vision and its application in image analysis.

**Unit I**

**Unit II**

**Unit III**
Stereo: Shape from shading, Photometric stereo, Texture, Occluding contour detection, Motion Analysis: Motion detection and optical flow Structure from motion

**LEARNING OUTCOMES**
At the end of the course students should be able to:

CO 1. Implement fundamental image processing techniques required for computer vision.

CO2. Perform shape analysis

CO3. Implement boundary tracking techniques

CO4. Apply chain codes and other region descriptors

CO5. Implement motion related techniques. CO6: Develop applications using computer vision techniques.

**Text Book:**

**Reference Book:**
1. E. Trucco and A. Verri, *Introductory Techniques for 3D Computer Vision*, Publisher:

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
OBJECTIVES:
The objective of this course is to provide the necessary knowledge to design and develop dynamic, database-driven web applications using PHP version 5. Students will learn how to connect to any ODBC-compliant database, and perform hands on practice with a MySQL database to create database-driven HTML forms and reports etc. Students also learn how to configure PHP and Apache Web Server. Comprehensive lab exercises provide facilitated hands on practice crucial to develop competence web sites.

Unit I: (9 L)
Introduction to Lamp, Linux operating system, Apache web server, Mysql database server, PHP scripting, purpose of using Lamp, Lamp versus other solutions; installing linux, choosing the correct linux, hardware requirements, installing fedora, pre-installation, type of installation, hard disk partitioning, boot loader selection, network configuration, firewall configuration, package selection, package installation, bootable disk creation, post installation setup.

Unit II: (8 L)
Booting linux, initialization scripts, rc scripts, run level scripts, login process, exploring linux shell, understanding bash, understanding linux filesystem: /bin, /boot, /dev, /etc, /home, /lib, /lost+found, /mnt, /opt, /proc, /root, /sbin, /tmp, /usr, /var; managing users and groups, /etc/passwd, /etc/group, linux passwords, user administration, group administration, modifying users or groups, managing services, creating disk quotas, starting and stopping system services, controlling access to services, managing software, source tarballs, source code vs binary packages, RPM and RPM source packages, performing system backup and recovery, critical data, backup media, backing up your system, system restoration.

Unit III: (9 L)
Apache web server, apache 1.3 vs apache 2.0, new features of apache 2.0, module enhancements, apache 1.3 features, apache 1.3 modules, installing apache web server, removing apache web server RPMs, apache installation methods, apache directories, apache programs, understanding httpd.conf file, apache virtual host, enabling directory listings, password protecting web directories, configuring cgi-bin directories, using .htaccess file for configuration; understanding mysql, flat file vs relational databases, advantages and limitations of mysql, mysql versions, installing mysql, common configuration directives, mysql server and client, editing configuration files, enhancing security, mysql administration, performance and replication. purpose of PHP, PHP versions, installing PHP, configuration options and extensions, compiling and installing PHP, apache configuration to handle PHP, PHP INI file; setting up apache virtual host, preparing mysql database, testing apache, PHP and mysql, scripting database connection, scripting data insertion, scripting data extraction and formatting.

LEARNING OUTCOMES
After the completion of course, students will get hands on experience on
CO1. Uses of Linux & MySQL.
CO2. Understanding & working of Apache Web server
CO3. Understanding of PHP & its uses in web development.

Text Book:
1. James Lee, Brent Ware, Open Source Development with LAMP, Addison-Wesley Professional, 2002.

Reference Book:
OBJECTIVES:
Students undergoing this course are exposed to learn an overall knowledge of soft computing theories and fundamentals & understanding on the fundamentals of non-traditional technologies and approaches to solving hard real-world problems.

Unit I:  

Unit II:  

UNIT III:  

LEARNING OUTCOMES
Upon the successful completion of the course, Students will be able to
CO1. Discuss about the use of neural network and its architecture.
CO2. Understanding the application of Soft Computing
CO3. Will understand the MATLAB setup for soft computing.

Text Book:

Reference Book:
**Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)**

**Applicable for Batch: 2019-23**

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Title</th>
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<td>CS474</td>
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<td>LTP 2 0 2 Credit 3 Subject Category DE Year 4th Semester VIII</td>
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**OBJECTIVES:**
The objective of the course is to make proficient students in the area of software modelling & design using object oriented concepts.

**Unit-1**
**Introduction to Object Oriented Modelling**
Object Oriented Modeling, Characteristics Object Oriented Modeling, Class and Objects Links and Association, Generalization and Inheritance, An Object Model, Benefits of OO Modeling, Introduction to OOAD tools

**Unit-2**
**UML and object oriented Design**

**Object Oriented Design**
**System Design:** System Design: An Object Oriented Approach, Breaking into Subsystems, Concurrency Identification, Management of data store, controlling events between Objects, Handling Boundary Conditions.

**Object Design**
Object Design for Processing, Object Design Steps, Designing a Solution, Choosing Algorithms, Choosing Data Structures, Defining Classes and delegation of Responsibilities to Methods.

**Unit-3**
**Object Modelling**
Advance Modeling Concepts: Aggregation, Abstract Class, Multiple Inheritance, Generalization as an Extension, Generalization as a Restriction, Metadata, Constraints, An Object Model

**Dynamic Modelling**
Events, State and State Diagram, Elements of State Diagrams, Examples of State Diagrams

Advance Concepts in Dynamic Modeling, Concurrency, A Dynamic model

**Functional Modeling**
Functional Models, Data Flow Diagrams, Features of a DFD, Design flaws in DFD

A Functional model, Relationship between Object, Dynamic, and Functional Models

**LEARNING OUTCOMES**
At the end of the course the students will able to learn:

CO1. Ability to analyze and model software specifications.

CO2. Ability to abstract object-based views for generic software systems.

CO3. Ability to deliver robust software components.

**Text Book:**

**Reference Book:**


Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
OBJECTIVES:
The objectives of this course is to the comprehensive and in-depth knowledge of Business Intelligence (BI) principles and techniques by introducing the relationship between managerial and technological perspectives. This course is also designed to expose students to the frontiers of BI-intensive BIG data computing and information systems, while providing a sufficiently strong foundation to encourage further research.

Unit I
Introduction to Business Intelligence,

Unit II
Basics of Data Integration (Extraction Transformation Loading),
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,
Basics of Enterprise Reporting
Introduction to enterprise reporting, concepts of dashboards, balanced scorecards, introduction to SSRS Architecture, enterprise reporting using SSRS

LEARNING OUTCOMES
After completing this course, students will be able to:

Co1. Identify the major frameworks of computerized decision support: decision support systems (DSS), data analytics and business intelligence (BI).

CO2. Explanation about the foundations, definitions, and capabilities of DSS, data analytics and BI.

CO3. Demonstration about the impact of business reporting, information visualization, and dashboards.

Text Book:

Reference Book:
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23

<table>
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**OBJECTIVES:**
This course aims to make students aware about different techniques for mobile computing.

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 hand offs. 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

Distributed Mobile Environment: Distributed file system for mobile environment, Mobile Middleware: Service discovery, adaptation, mobile agents.

**LEARNING OUTCOMES**
At the end of this course students shall understand and:
CO1. Learn the basics of wireless communication systems.
CO2. Learn the Wireless application Protocols to develop mobile content application and to appreciate the social and ethical issues of mobile computing, including privacy.
CO3. To Develop and demonstrate various routing protocols.

**Text Book:**

**Reference Book:**

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
OBJECTIVES:
Students will be explored to the interconnection and integration of the physical world and the cyber space. They are also able to understand the design principles of IOT Devices.

Unit -1 (8 L)

Design Principles for Connected Devices: IoT/M2M systems layers and design standardization, communication technologies, data enrichment and consolidation, ease of designing and affordability

Unit -2 (9 L)
Hardware for IoT: Sensors, digital sensors, actuators, radio frequency identification (RFID) technology, wireless sensor networks, participatory sensing technology.
Embedded Platforms for IoT: Embedded computing basics, Overview of IOT supported. Hardware platforms such as Arduino, NetArduino, Raspberry pi, Beagle Bone, Intel Galileo boards and ARM cortex.

Unit -3 (9 L)
Challenges in IoT Design Challenges: Development challenges, Security challenges, Other challenges.

IoT Applications: Smart metering, e-health, city automation, automotive applications, home automation, smart cards, Communicating data with H/W units, mobiles, tablets, Designing of smart street lights in smart city.

LEARNING OUTCOMES
At the end of course students will become proficient in the following aspects of IOT:

CO1. Able to understand the application areas of IOT ·
CO2. Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks ·

CO3. Able to understand building blocks of Internet of Things and characteristics.

Text Book:

Reference Book:
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)

Applicable for Batch: 2019-23

Humanities Electives IV

<table>
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<tr>
<th>Subject Code</th>
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Course Objective

- To promote an integral and holistic growth of young minds
- Develop a broad understanding of Indian society and intercultural literacy through cultural immersion.
- Deepen your knowledge of Indian development, environmental, and cultural issues through coursework, local engagement, and independent projects.

Unit 1 Indian Culture: An Introduction

Characteristics of Indian culture, Significance of Geography on Indian Culture; Society in India through ages - Ancient period - Varna and Caste, family and marriage in India, position of women in ancient India, Contemporary period; caste system and communalism.

Unit 2 Indian Languages and Literature


Unit 3 Brief History of Indian Arts and Architecture

Indian Art & Architecture: Gandhara School and Mathura School of Art; Hindu Temple Architecture, Buddhist Architecture, Medieval Architecture and Colonial Architecture.

Indian Painting Tradition: ancient, medieval, modern Indian painting and Odishan painting tradition Performing Arts: Divisions of Indian classical music: Hindustani and Carnatic, Dances of India: Various Dance forms: Classical and Regional, Rise of modern theatre and Indian cinema.

Unit 4 Spread of Indian Culture Abroad

Causes, Significance and Modes of Cultural Exchange - Through Traders, Teachers, Emissaries, Missionaries and Gypsies, Indian Culture in South East Asia India, Central Asia and Western World through ages

COURSE OUTCOME:

- Understand background of our religion, customs institutions, administration and so on.
- Understand the present existing social, political, religious and economic conditions of the people.
- Analyze relationship between the past and the present relevance of Indian tradition.
- Develop practical skills helpful in the study and understanding of historical events.

TEXT BOOKS

5. Christie, J.W., 1995, State formation In early Maritime Southeast Asia, BTLV

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML) 
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Humanities Electives IV

<table>
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Course Objective
- Develop an understanding of Indian philosophical systems
- To empower for self-exploration

Unit 1 Introduction 11Hrs.
Meaning of Philosophy, Origin of Philosophy in India, Major Indian philosophical systems: Sankhya: Metaphysics, Theory of causation, Prakriti, Purusha, Evolution, Yoga: Concept of Chitta, Types and Modification of Chitta, Eight-fold Yoga & Vedant: Notions of Maya & Brahma

Unit 2 Major Principles 5Hrs.
Panchkosha, Triguna, Tridosh, Macrocosm-Microcosm

Unit 3 Major Contemporary Indian Philosophers 6Hrs.

Unit 4 Activities & Projects 4Hrs.
Identifying human prakriti, Using Trigun inventory, Understanding self

COURSE OUTCOME:
- Students will acquire understanding of concepts of Indian philosophy.
- Students will be enabled to analyze their self.
- The students will be able to relate some of the core concepts and theories of modern Indian philosophy to concepts and ideas in classical Indian philosophy.
- The students will be able to appreciate how philosophical approaches may be integrated more practically as a “way of life”.

TEXT BOOK

REFERENCE BOOKS
- The Yoga Sutras of Patanjali: (annoted commentary) (Divine Cool Breeze Realized Writers Book 15) by Shri Patanjali, Shri Mataji Nirmala Devi (Introduction), Charles Johson (Translation)
Humanities Electives IV

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<thead>
<tr>
<th>Subject Code</th>
<th>Subject Title</th>
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</table>

**Course Objective**
- The course attempts to analyze the structure and process of industrial organizations from the sociological perspective.
- The course enables students to have a general view of modern industry.

**Unit 1**
7Hrs.

**Unit 2**
7Hrs.
Industrial Disputes: Concept, Features and Kinds of disputes, Settling disputes, Mediation, Arbitration, Conciliation, Negotiation, The Indian Worker: Features of Indian worker, the contribution of social - Philosophy, family, caste and community in determining the attitude of workers.

**Unit 3**
6Hrs.
Trade Union: Concept, Features, Functions and Types, History of Trade Union Movement in India Trade Unions and Challenges of Privatization and Globalization; Law and work, Decline of Trade Unions.

**Unit 4**
6Hrs.
Dynamics of Industrial Relations: Corporate Social Responsibility, Inclusion of Women in the Corporate Sector, Scope of Industrial Sociology in India; Impact on Employment, Impact on HRD, impact on wages and benefits, Modern Industry in India

**COURSE OUTCOME:**
- It will enable students to demonstrate the different human components that make up modern industry.
- The student will get exposed to a specialized area of sociology and its insights.
- Apply sociological concepts and theories to understand contemporary social issues and/or public debates about these issues.
- Communicate sociological concepts and/or research in a manner that is appropriate for the intended audience (e.g., academic, lay audience).

**TEXT BOOKS**
4. Pascal Gilbert: Fundamental of Industrial Sociology; Orient-Longman.
5. E.V. Schneider – Industrial sociology

**REFERENCE BOOKS**
- Sheth, N R, 1979, Industrial Sociology in India, Jaipur Rawat.

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
Course Objective

- To provide the overview of sustainable and its needs to the students.
- To provide the importance and components of sustainable development to the students.
- To provide the association of social and economic development to the students.

Unit 1 Overview of Sustainable Development

History and emergence of the concept of Sustainable Development, Components of SD i.e. Economic, Social, Human, Institutional, Technological and Environmental development; Definitions, Sustainability in Ecosystem Services; natural resource degradation, greenhouse gases, factors affecting SD (i.e. Industrialization, urbanization, population growth, globalization, etc.)

Unit 2 Policies on Sustainable Development at international level

Government Policies for SD in India; Socio-economic policies for sustainable development in India, Sustainable development through trade, Carrying Capacity, global policies for sustainable development

Unit 3 Sustainable Development and International Contribution

SDGs and MDGs, Complexity of growth and equity, International Summits, Conventions, Agreements, Initiations of international organizations like WHO, UNDP, WTO, FAO and World Bank towards sustainable development

Unit 4 Measurement of Sustainable Development

Role of developed and developing countries in the sustainable development, Demographic dynamics and sustainability, integrated approach for resource protection and management; Index based estimation of SD i.e. Environmental Sustainable Development Index and sustainable development, and other index

Course Outcome:

- The students will be able to understand the importance of natural resource in economic development.
- The students contribute significant efforts towards sustainable development
- Develop a future-oriented perspective that highlights the significance of their decisions, choices and actions on the quality of life of present and future generations.
- Understand and are empowered to address the real causes and consequences of unsustainable behaviour within the context of an interdependent and globalised world.

TEXT BOOK


REFERENCE BOOKS

Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23

<table>
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<tr>
<th>Subject Code</th>
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Course Outline: To provide a detailed idea how the internet is connecting the entire world and helps to live a smart life with its technology.

Course Objective:

1. Vision and Introduction to IoT.
2. Understand IoT Market perspective.
5. Real World Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

Course Pre/Co-requisite (if any): Wireless Sensor Networks

Detailed Syllabus

UNIT 1: M2M to IoT (05 Lectures)

The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, use case example, Differing Characteristics.

UNIT 2: M2M to IoT (A Market Perspective)(10 Lectures)


IOT related open source software tools introduction; tools like IoTivity, IBM Blue Mix. Introduction to Contiki, Cooja, Raspberry Pi etc.

UNIT 3: M2M and IoT Technology Fundamentals (05 Lectures)

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: IoT Architecture-State of the Art (12 Lectures)


UNIT 5: Industrial Automation (08 Lectures)

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

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
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Commercial Building Automation: Introduction, Case study: phase one-commercial building automation today, Case study: phase two-commercial building automation in the future.

Learning Outcome
- Explain the definition and usage of the term 'The Internet of Things' in different contexts
- Understand where the IoT concept fits within the broader ICT industry and possible future trends
- Able to build and test a complete working IoT system
- Pursue lifelong learning for professional advancement.

Text book [TB]:

Reference books [RB]:

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
### Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
**Applicable for Batch: 2019-23**

<table>
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<th>Subject Code</th>
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</table>

**Course Objective:**
1. Understand the fundamentals of wireless networks.
2. Understand and evaluate emerging wireless technologies and standards.
3. To explore mobile security issues.
4. To explore the mobility concept.

**Detailed Syllabus**

**UNIT 1**

**Introduction:** Mobile computing with functions & devices, Networks, Middleware & gateways, Application & services, Developing mobile computing applications, Security & standards why it necessary, Architecture for mobile computing.  
*(3 L)*

**UNIT 2**

**Emerging Technologies:** Bluetooth, Rfid, WiMAX, Mobile IP, IPv6, GSM architecture, Call routing in GSM, Mobile computing over SMS, Value added service through SMS, GPRS architecture & operations, 3G & applications  
*(10 L)*

**UNIT 3**

**Wireless Transmission:**
Signal propagation- path loss of radio signals, additional signal propagation effects, Multipath propagation, Multiplexing- Space division, frequency division, time division, code division, Modulation- ASK, FSK, PSK, AFSK, APSK, Multi-carrier modulation  
Spread spectrum- Direct sequence & frequency hopping  
Mac- Hidden & exposed terminals, near- far terminal, SDMA, TDMA, FDMA, Fixed TDM, CSMA, PRMA, Multiple access with collision avoidance  
*(12 L)*

**UNIT 4**

**Wireless LAN:** IEEE 802.11 in details, HIPERLAN, Link manager protocol, L2CAP, security, SDP.  
*(5 L)*

**UNIT 5**

**Mobility & Security in mobile computing:** HTTP, Wireless application protocol- architecture, wireless datagram protocol, wireless transport layer security, wireless transaction & session protocol, WML, Push architecture, push/ pull services, i-mode & SyncML  
Information security, Security techniques & algorithms, public key infrastructure,  
*(10 L)*

**Learning Outcome**

At the end of the course, Learning Outcomes Having successfully completed this course, the student will demonstrate:
1: Apply the fundamental design paradigms and technologies to mobile computing applications.
2: Develop consumer and enterprise mobile applications using representative mobile devices and platforms using modern development methodologies.
3: Appraise the quality and performance of mobile applications.
4: Assess and implement security principles in mobile applications.
5: Evaluate wireless network topologies, wireless connectivity and characteristics, and the impact of wireless networks on security and Internet communications.
6: Select appropriate wireless technologies in commercial and enterprise applications.

Text book [TB]:

Reference books [RB]:
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)  
Applicable for Batch: 2019-23

<table>
<thead>
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<td>Fundamental of Communication &amp; Networks</td>
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</table>

Objectives of the Course:
- To understand the concept of Computer Communication.
- To learn the basics of Data communication and Networks
- To develop and design the protocol systems for advance computer communication.

UNIT I: Introduction to Communication:
Communication system, Analog and Digital Communication, channel bandwidth. Ideal and Practical Filters, Concept of Signal Distortion over a Communication Channel, Energy Signal and Power Signal, Introduction to noise in Communication systems. 6L

UNIT II: Introduction to Modulation techniques:
Concept of Amplitude Modulation, Concept of Frequency & Phase Modulation, Concept of ASK, FSK & PSK, Concepts of PCM. 8L

UNIT III: Introduction to Data Communication Network & OSI Model:
Switching systems, network hardware and software, Layering, design issues for layering, reference models and their comparison, example of networks. Concepts of OSI model. 6L

UNIT IV: Introduction to Data Communication Protocols and transmission media
MAC protocols- Aloha, CSMA, collision free protocols, Ethernet, IEEE 802.3 standard, IP protocols, IP addressing, OSPF, IPv4, IPv6. Transmission media and channel impairments, multiplexing, digital channels, switching. Repeaters, bridges, routers and gateways. 8L

Text Books:

Reference Books:

List of Experiments:
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 and Demodulated wave.
4. To generate frequency modulated signal and determine the modulation index and bandwidth for various values of amplitude and frequency of modulating signal and to demodulate a FM signal.
5. To study ASK modulation and Demodulation.
6. To study FSK modulation and Demodulation.
7. To study PSK modulation and Demodulation.
8. To Study TDM/PCM Transmitter /Receiver.

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
OUTCOMES OF THE COURSE:
The course provides an understanding of:

- Computer Communication and networks.
- Protocol design and their design issues.
**Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)**

**Applicable for Batch: 2019-23**

<table>
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<th>Subject Code</th>
<th>Subject Title</th>
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<tr>
<td>LTP 3 0 0</td>
<td>Credit 3</td>
<td>Subject Category DE/OE Year 4 Semester VIII</td>
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</table>

**Objectives of the Course:**
The students will learn

- Requirement of bio-medical and its application
- Concept of bio-potential electrodes and measurements related to them.
- Concepts of bio-transducers and measurements related to them.
- Concept of bio-medical instruments and their uses experimentally.

**UNIT I: ANATOMY AND PHYSIOLOGY:**
Basic Cell Functions, Origin of Bio-potentials, Electrical Activity of Cells, components of man Instrument system, types of bio-medical stems, design factors and limitations of biomedical instruments, terms and transducers to various physiological events. 8L

**UNIT II: BIO-POTENTIAL ELECTRODE:**
Types of bio-potential electrodes., Electrode-Electrolyte interface, half cell potential, Polarization- polarisable and non-polarisable electrodes, Ag/AgCl electrodes, Electrode circuit model; Electrode and Skin interface and motion artifact. Body surface recording electrodes for ECG. Electrodes standards. 8L

**UNIT III: BIO-TRANSUDER:**
Transduction Principles: Resistive Transducers Strain Gauge- types, construction, selection materials, Gauge factor, Bridge circuit, Temperature compensation. Strain Gauge type Blood pressure transducers. Inductive Transducers, Capacitive Transducer, Piezoelectric Transducer. 8

**UNIT IV: BIOTELEMETRY AND ELECTRICAL SAFETY:**
Bio-telemetry design, single channel bio telemetry transmitter and receiver system based on AM, FM and, pulse modulation. Significance of Electrical Danger, physiological effect of current, ground shock Hazards. 8L

**Text Books:**

**Reference Books:**
1. J.G. Webster, ‘Medical instrumentation application and design’, Houghton Miffin Co., Boston USA.

**OUTCOMES OF THE COURSE:**
The course provides an understanding of:

- Bio-medical instruments and measurements.
- Principle of working of bio-medical transducers.
- Skills to use modern bio-medical tools and equipment for measurements related to human body.

**LIST OF EXPERIMENTS**
1. Pulse measurement
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23

3. Heartbeat measurement
4. Automatic BP measurement
5. Heart sound study using electronics stethoscope
6. ECG measurement

Following experiments to be done on the breadboard
7. Design of low noise and low frequency amplifier for biomedical application
8. Design of Instrumentation amplifier
9. Construction of chopper amplifier

Two Value Added Experiments to be added by Instructor.
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23

<table>
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<tr>
<th>Subject Code</th>
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</table>

Objectives of the Course

- To make students understand the construction, working principle and application of various transducers used for flow measurement, strain measurement, pressure and vacuum measurement,
- force, torque and power measurement
- To develop an understanding about the different types of telemetry systems used and types of instruments required for display and recording of the data to be transmitted
- Understand about components, characteristics of various control processes used and their modes of operation.

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 1 Transducer – II: Capacitive, Piezoelectric Hall effect and opto electronic transducers.

Measurement of Motion, Force pressure, temperature, flow and liquid level.

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.

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.

Display Devices and Recorders: Display devices, storage oscilloscope, spectrum analyser, strip chart & x-y recorders, magnetic tape & digital tape recorders.

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:

Reference Books
3. Rajendra Prasad,”Electronic Measurement and Instrumentation Khanna Publisher

Outcome of the Course:
- Identify the appropriate instruments for measurement of different quantities.
- Ability to analyze, formulate and select suitable sensor for the given industrial applications
- Ability to analyze various control processes used and their modes of operation.

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23

<table>
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<tr>
<th>Subject Code</th>
<th>Subject Title</th>
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</table>

**Course Objective:** This course provides an overview on principles of ergonomics and human factors, their applications to the design and management of industrial systems, Engineering anthropometry, Human performance, human-technology interaction, work place and work station design and concept of value engineering. To address the underlying concepts, methods and application of Value Engineering

**Course Pre/Co-requisite (if any):**

**Detailed Syllabus**

**UNIT 1: Introduction of Ergonomics**
Background of ergonomics, historical evolution of ergonomics, definition of ergonomics, aspect of ergonomics, man machine interaction, and man machine closed loop system, man machine system (MMS)

**Work physiology**
Muscle structure, metabolisms, circulatory and respiratory systems, energy expenditure and workload

**UNIT 2: work related MSDs risk and work postures assessment**
Introduction, assessment of work postures using RULA Methods, work posture assessment using rapid entire body assessment tool (REBA)

**Office Ergonomics**
Introductions, Issues in workstation design, seat design, engineering anthropometry and work design, A case study: an investigation on passenger seat design in sleeper class coaches in Indian trains.

**UNIT 3: Physical stress**
- Introduction, vibration, occupational noise exposure, sound, source of noise and vibration, basic theory of noise measurement, Noise measuring meters, basic sound level meters, noise control, permissible limits of exposure with respect to occupational noise.

**UNIT 4: Value Engineering**
- Introduction: Definition, value engineering recommendations, programs, advantages, Evaluation of function, determining function, classifying function, evaluation of costs, evaluation of worth, determining worth, and evaluation of value.
- Value Engineering Job Plan: Introduction, orientation, information phase, Function phase, creation phase, evaluation phase, Investigation phase, implementation phase, speculation phase, analysis phase.

**UNIT 5:** Selection of Evaluation of Value Engineering Projects: Project selection, Methods selection, value standards, application of Value Engineering methodology.
- Initiating Value Engineering Program: Introduction, training plan, career development for Value Engineering specialties.
- Fast Diagramming: Cost models, life cycle costs.
- Value Engineering level of Effort: Value Engineering team, Co-ordinator, designer, different services, definitions, construction management contracts, value engineering case studies

**Learning Outcome**

At the end of the course the student can:
- CO1: Specify and design ergonomically appropriate industrial workstations for the industrial and office work environment.
- CO2: Identify information-centered human factors relating to visual, illumination, controls, displays and symbols.
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
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CO3: Compare, contrast and assess human body-centered ergonomic designs for posture, material handling, repetitive motion factors, heat stress, noise and vibration.

CO4: Define the ergonomic factors intrinsic in evaluating accidents, human errors and safety related incidents.

CO5: Student will understand the concepts, methods and application of Value Engineering

Text book [TB]:

Reference books [RB]:

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Title</th>
<th>Product Design And Development</th>
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**Course Objective:** This course aims at introducing the students to the basic concepts of engineering design and product development with focus on the front end processes. At the end of this course the student is expected to demonstrate an understanding of the overview of all the product development processes and knowledge of concept generation and selection tools.

**Course Pre/Co-requisite (if any):** Manufacturing Process, Industrial Engineering and Management

**Detailed Syllabus**

**UNIT 1:**
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 2:**
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 3:**
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 4:**
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 measurement of customers response.
Concept Testing: Elements of testing: qualitative and quantitative methods including survey.

**UNIT 5:**
Intellectual Property: Elements and outline, patenting procedures, claim procedure.
Design for Environment: Impact, regulations from government, ISO system, case studies.

**Learning Outcome**

At the end of the course the student can:
CO1: Product Design and Innovation course is intended to introduce overall awareness of the product design process.
CO2: This course will give an understanding of methods, tools and techniques applied in product design.
CO3: This course includes overview of innovation, product design process, user study, need/problem identification, development of design brief, understanding competitive benchmarking, aspects of human factors in product design, tools for creative concept generation, and prototyping/model making and evaluation techniques for user-product interaction.
CO4: This course will be explained with lectures including case studies and hands-on exercises. This will help students to generate creative ideas in to product design, considering human factors aspects.
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23

Text book [TB]:

REFERENCES [RB]:

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23

<table>
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<tr>
<th>Subject Code</th>
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<td>ME452</td>
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**Course Objective:** To provide students an overview of global energy resources with focus on renewable energy sources and their importance in the context of limited supply of conventional energy resources & global warming.

**Course Pre/Co-requisite (if any):** Basic Thermodynamics, Heat Transfer

**Detailed Syllabus**

**UNIT 1: ENERGY RESOURCES**
Introduction: Energy & its importance in social & economic development; energy demand & supply, world energy status, energy scenario in India; energy & environment, greenhouse effect & global warming; role of renewable energy sources; a brief introduction to various renewable energy sources – hydro, solar, biomass, wind, geothermal & ocean energy – their availability & present status.

**UNIT 2: SOLAR ENERGY**
The sun as a source of energy, extraterrestrial & terrestrial solar radiation; solar radiation data & geometry, solar radiation on horizontal & inclined surfaces; solar thermal systems – various types of solar collectors & their applications in cooking, drying, water heating, distillation, space heating & cooling, refrigeration and power generation.
Solar photovoltaic systems, solar cell fundamentals, performance & characteristics, types of solar cells; solar cell, module, and array construction; solar PV applications.

**UNIT 3: BIOMASS ENERGY**
Origin of biomass, photosynthesis & generation of biomass, availability of biomass, usable forms of biomass – fuel wood, charcoal, fuel pellets, biodiesel, bioethanol, biogas and producer gas; biomass conversion technologies, thermochemical & biochemical methods, biomass gasification, classification & operational parameters of biogas plants, energy recovery from urban waste, sewage to energy conversion.

**UNIT 4: WIND ENERGY**
Origin & nature of winds; history of power from winds; global & local winds; estimation of wind energy at a site; maximum power extraction from wind – Betz criterion; capacity factor of wind power plants; types of wind turbines – horizontal and vertical axis wind turbines; wind energy storage; environmental & economic aspects; present status of wind energy systems.

**UNIT 5: GEOTHERMAL & OCEAN ENERGY**
Structure of earth’s interior; origin & distribution of geothermal energy, types of geothermal resources – exploration & development of hydrothermal, geo-pressured & hot dry rock resources; electrical power generation from geothermal energy; environmental & economic considerations.
Ocean energy; tidal, wave & ocean thermal energy, energy from tidal streams (marine currents); technology for harnessing tidal & wave energy; ocean thermal energy conversion technology.

**Learning Outcome**

At the end of the course the student will:
CO1: Understand about the interaction between energy, economy, environment, and social development.
CO2: Appreciate the importance of renewable energy sources & future energy systems based on them.
CO3: Possess the basic technical knowledge to develop energy systems based on solar, biomass, wind, geothermal & ocean energy.

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
Text book [TB]:

References [RB]:
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
Applicable for Batch: 2019-23

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Course Objective: The course provides wide knowledge about basics of GIS and its applications in various fields

Unit-1: Introduction

8L
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-2: Components

12L
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-3: Classifications and Functions

10L
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-4: Analysis

5L
Overlay: arithmetical, logical and conditional overlay, buffers, inter visibility, aggregation; Network analysis;

Unit-5: Applications

4L
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.

Course Outcome: The students will learn from this course:

- Basic understanding of GIS concepts, components.
- Analyzing geo-spatial data with various techniques and GIS tools
- Apply the concepts in solving environmental and engineering problems
- Create new information and theoretical knowledge after applying GIS tools

Books Recommended:

Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
**Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)**

**Applicable for Batch: 2019-23**

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<td>PE491</td>
<td>Carbon Capture and Sequestration Technology</td>
<td>3 0 0</td>
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</table>

1. **Course Summary**
   The course provides information about the students to learn the basic concept and Applications of Carbon capture and storage process. In this course, students will learn about carbon capture techniques and the concept of the contribution of fossil fuel to climate change. During this course students will examine the Co2 emission and Carbon dioxide recycling.

2. **Course Objectives**
   The students should be able to:

   1. The objective of this course is make students familiar with the principles and applications of carbon capture and storage capture techniques and role of CCS.

3. **Course Outcomes**
   1. To acquaint the students substantially to the objectives and necessity of Carbon Sequestration and capture.
   2. To introduce the contribution of fossil fuel to climate change.
   3. To understand the concept of emission and recycling of CO2.
   4. To introduce the candidates to the concept of underground storage and other Carbon Capture and sequestration concepts.
   5. To understand the implementation of CCS technology and IPCC.

4. **Curriculum Content**
   **UNIT 1**
   Introduction: Scope, Objectives and Necessity of CCS.

   **UNIT 2**
   The contribution of fossil fuels emission to Climate change and global warming. Concept of Carbon Credit and carbon footprint.

   **UNIT 3**
   Carbon capture techniques: Carbon-di-oxide emission, Scrubbing of CO2, Carbon dioxide recycling.

   **UNIT 4**
   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**
   Strategy for implementing CCS technology: Modelling of Cost and Performance of CCS Plants. Role and function of IPCC.

**Text book [TB]:**

1. Carbon Capture; Jennifer Wilcox; Springer
2. Capturing Carbon – The new weapon in the War Against Climate Change; Mills, Robin M.; Columbia University Press

**Reference books [RB]:**

*Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019*
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML) 
Applicable for Batch: 2019-23

1. Piping and pipeline engineering, George A. Antaki, Marcel Dekker Inc. New York.
2. Fundamentals of pipeline engineering by J. Vincent Genod, Technip Editions

5. Teaching and Learning Strategy
   All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details.
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)

Applicable for Batch: 2019-23

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<tr>
<th>Subject Code</th>
<th>Subject Title</th>
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<td>Optimization Techniques</td>
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Subject Category: Open Elective
Year: 4th
Semester: VIII


Unit 3: Introduction to Transportation problems, various methods of Transportation problem, Variations in Transportation problem, introduction to Assignment problems, variations in Assignment problems. Sequential optimization, Representation of multistage decision process; Types of multi stage decision problems; Concept of sub optimization and the principle of optimality.

Unit 4: Optimization techniques, Memetic algorithm, Differential evolution, Evolutionary algorithms, Dynamic relaxation, Genetic algorithms, Hill climbing with random restart, Genetic Algorithm (GA), Artificial Bee Colony (ABC), Particle Swarm Optimization (PSO), Firefly algorithm, Fish School Search, Fly algorithm, Ant colony optimization algorithms

References:


Amended by the BoS and approved by the Academic Council at its 11th Meeting held on 29.04.2019
**Course Objective:**

To create an overview and understanding of various art forms that exists from ancient to modern times.

**Unit 1: INTRODUCTION**
Understanding various art forms in society and in different cultures.

**Unit 2: Sociological Perspective**
Relationship between art, culture and society. Influence of art forms on people.

**Unit 3: Appreciation-I: Painting/ Sculptures**
Understanding and appreciating films/ documentaries from past to present times and between east and west.

**Unit 4: Appreciation-II: Films/ Documentries**
Understanding and appreciating painting and sculptures from past to present times and between east and west.

**Unit 5: Appreciation-III: Indigenous/ Folk Art**
Understanding and appreciating Indigenous/ Folk art from past to present times and between east and west.

**LEARNING OUTCOME:**
4. The student will be able to understand the various art forms.
5. The students will be able to understand and establish a relationship between art, culture and society.
6. The students will be able to appreciate the various art.

**Text Books:**
3. Creative Authenticity: 16 Principles to Clarify and Deepen Your Artistic Vision, Ian Roberts

**Reference Books:**
The Writer: A Concise Complete and Practical Text Book of Rhetoric. Designed to Aid in The Appreciation, George Lansing Raymond
Course Structure & Syllabus of B.Tech – Computer Science & Engineering (With specialization in ML)
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Unit 1
Introduction to nanotechnology, definition, history of nanotechnology, nanotechnology in relation to other branches of engineering, characteristic length scale of materials and their properties, classification of nanomaterials, dimensionality and size dependent phenomena, confinement in 0-D, 1-D, 2-D and 3-D, surface to volume ratio, fraction of surface atoms, surface energy.

Unit 2
Nanomaterials synthesis techniques; top-down and bottom-up techniques, ball milling, PVD, CVD, self-assembly.

Unit 3
Nanomaterials characterization; XRD, SEM, TEM, AFM, UV-VIS.

Unit 4
Nanomaterials and their properties: carbon based nano materials, metal based nano materials, quantum dots, biological nano materials.

Unit 5
Applications of nanotechnology in engineering, solar energy conversion, nanomedicine.

Text Books:
1. Poole, Jr. CP and Owens, FJ, “Introduction to Nanotechnology”, Wiley India. 2006.