

**Course Structure & Syllabus of
M.Tech-Construction Engineering & Management
Applicable for Batch: 2017-2019**

**DIT UNIVERSITY
Dehradun**



**Detailed Course Structure & Syllabus
of
M.Tech-Construction Engineering &
Management**

**Course Structure & Syllabus of
M.Tech-Construction Engineering & Management
Applicable for Batch: 2017-2019
Course Structure**

Year: 1

Semester: I

Course Category	Course Code	Course Title	L/S*	T	P	Credit
DC	AR601	Principles of Management	3	0	3	3
DC	AR602	Project Planning & Scheduling	4	0	4	4
DC	AR603	Research Methodology	2	0	2	2
DC	AR604	Construction Equipment & Management	3	0	3	3
DC	AR605	Environmental Management & Impact Assessment	4	0	4	4
		Total				16

Year: 1

Semester: II

Course Category	Course Code	Course Title	L/S*	T	P	Credit
DC	AR606	Project Formulation & Appraisal	4	0	4	4
DC	AR607	New Building Materials & Technology	3	0	3	3
DC	AR608	Resource Management in Construction	3	0	3	3
DC	AR609	Building Contract Administration	3	0	3	3
DC	AR610	Computer Applications & Technology	2	3	6	3.5
DE	AR611	Summer Training	-	-	-	-
		Total				16.5

Course Structure & Syllabus of M.Tech-Construction Engineering & Management Applicable for Batch: 2017-2019

Year: 2

Semester: III

Course Category	Course Code	Course Title	L/S*	T	P	Credit
DC	AR 701	Construction Finance Management	4	0	0	4
DC	AR 702	Risk Management in Construction Business & Projects	3	0	0	3
DC	AR 703	BOT, Turnkey Projects & FIDIC	3	0	0	3
DC	AR 704	Project Quality & Safety	3	0	0	3
SEC	AR 705	Construction Projects Case Study				3
PE		Departmental Elective-1	3	0	0	3
PE		Departmental Elective-2	3	0	0	3
		Total				22

Departmental Elective-3

AR-741- Construction & Project Account
AR-742- Laws Governing Infrastructure Projects

Departmental Elective-4

AR-744- Construction Marketing Management
AR-745- Site Management

Year: 2

Semester: IV

Course Category	Course Code	Course Title	L/S*	T	P	Credit
DC	AR 706	Thesis Project	0	0	24	12
DC	AR 707	Real Estate Management	2	0	0	2
DE		Departmental Elective-5	3	0	0	3
		Total	5	0	6	17

Departmental Elective-4

AR-747- BIM for Construction Management
AR-748- Infrastructure Development Through PPP Mode

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Summary of the Credit

Year	Semester	Total Credit
1	1	21
	2	21
2	3	22
	4	17
Total		81

Course Structure & Syllabus of M.Tech-Construction Engineering & Management Applicable for Batch: 2017-2019

Subject Code	AR-601	Subject Title	Principles of Management						
LTP	3 0 0	Credit	3	Subject Category		Year	1 st	Semester	I

Course Objective:

The course is intended to introduce the management principles to the students. The course will also introduce the various components of organization

Unit 1 : Introduction to Management and Construction Management

- What is Management? It's Need ,Importance & Purpose, Evolution of Managements thoughts Different Schools/ approaches to Management: Behavioral, Quantitative, Systems, Contingency Approach
- Nature of Construction Industry, Role of Architects and Engineer, Special Characteristics of Construction activity, their Influence on Construction Managements, Development of Construction Management, Scope of Construction Management Project Management, and Contracts Managements functions of Construction Managements.

Unit 2 : Project Manager

- Managing projects vis-à- via Managing Routine activities, Qualities of Project Manager, Selection of Project Manager, Training for a Project Manager.

Unit 3 : Management Planning

- What is planning? Importance of Planning, Types of Planning, levels of Planning, Strategies, Policies, Procedure, Rules etc. in the context of Planning.

Unit 4 : Organizing

- Organizing as a Management process, Principles of Organization, Different Structures of organizations such as line, Line & Staff, Functional, Matrix or project Organization: Characteristics, Features, their Merits and Limitation, Ownerships of Organization: Sole Proprietorship, Partnership, Private Ltd., Public Ltd. Introduction to Organizational climate, Decision Making, Group Decision Making, Staffing: What is Staffing? Steps involved in Staffing, Recruitment, Staffing, Performance Appraisal Development.

Unit 5 : Leading

- Leadership Characteristics, Entrepreneur, Leader And Manager Distinguished, Motivation, Managing Conflicts, Leadership Traits And Styles, Different Approaches To Leadership.
- Communication Process-Types Of Communication, Communication Model, Feedback, Effective Communication, Listening skills
- Controlling as a Management function, Direct and Indirect Control, Elements of Control, Prerequisites for Effective Control.

LEARNING OUTCOME:

- The students will be able to understand the various management theories and its evolution.
- The students will be able to understand the various aspects of an organization
- The students will understand the characteristics of a manager

Text Books:

1. Principles of Management, P.C Tripathi& P.N Reddy
2. Principles of Management, J.K Mitra

Reference Books:

- Management, Stoner J A & Freeman R E
- Management: Principles & Practice, S K Mandal

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Subject Code	AR-602	Subject Title	Project Planning & Scheduling						
LTP	4 0 0	Credit	4	Subject Category		Year	1 st	Semester	I

OBJECTIVE: The course is intended to disseminate about the application of Construction Management and to familiarize with the information technology based tools, applications during the Project Life Cycle.

Unit 1 : CONSTRUCTION PLANNING

- Basic Concepts in the Development of Construction Plans – Choice of Technology and Construction Method – Defining Work Tasks – Defining Precedence Relationships among Activities – Estimating Activity Durations – Estimating Resource Requirements for Work Activities – Coding Systems.

Unit 2 : SCHEDULING PROCEDURES AND TECHNIQUES

- Construction Schedules – Critical Path Method – Scheduling Calculations – Float – Presenting Project Schedules – Scheduling for Activity-on-Arrow and with Leads, Lags, and Windows – Scheduling with Resource Constraints and Precedence – Use of Advanced Scheduling Techniques – Scheduling with Uncertain Durations – Calculations for Monte Carlo Schedule Simulation – Crashing and Time/Cost Tradeoffs – Improving the Scheduling Process.

Unit 3 : COST CONTROL, MONITORING AND ACCOUNTING

- The Cost Control Problem – The Project Budget – Forecasting for Activity Cost Control – Financial Accounting Systems and Cost Accounts – Control of Project Cash Flows – Schedule Control – Schedule and Budget Updates – Relating Cost and Schedule Information.

Unit 5 : ORGANIZATION AND USE OF PROJECT INFORMATION

- Types of Project Information – Accuracy and Use of Information – Computerized Organization and Use of Information – Organizing Information in Databases – Relational Model of Databases – Other Conceptual Models of Databases – Centralized Database Management Systems – Databases and Applications Programs – Information Transfer and Flow.

LEARNING OUTCOME: The students should be able to:

- The students will be able to understand the practices of project management during the project life cycle.
- The students will be able to work on project management software and prepare the project schedule

Text Books:

- Construction Project Management: Planning, Scheduling and Controlling, K.K Chitkara

Reference Books:

1. Project Planning & Scheduling, Gregory T.H
2. A Handbook for Construction Project Planning & Scheduling, V.K Paul

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Subject Code	AR-603	Subject Title	Research Methodology						
LTP	2 0 0	Credit	2	Subject Category		Year	1 st	Semester	I

LEARNING OBJECTIVES

- Exposing the students to the vast possibilities in the field of research.
- Understanding the process and methodology of research.
- Designing sampling pools and measurement methodologies.
- Understanding collection of data and validating the authenticity.
- Understanding data interpretation and drawing analysis.

UNIT I: INTRODUCTION TO RESEARCH

Meaning of research, objectives of research, basic research issues and concepts, types of research: descriptive, analytical, fundamental and applied, quantitative, qualitative, Scientific methods in research, Research Process: Elements of Research process, Identification and Formulation of research problem, research question, need for defining a problem, process and technique to define a problem, role of a hypothesis, null and alternative hypothesis

UNIT II: RESEARCH DESIGN

Meaning and need of Research Design, Characteristics of a good Research Design, Types of Research Design, concept of variable, types of variable: dependent, independent, extraneous, confound relationship

UNIT III: SAMPLING DESIGN & MEASUREMENT IN RESEARCH

Implications of sampling design, characteristics of a good sample, probability sampling, non-probability sampling, sampling error, Concept of measurement, problems in measurement: validity and reliability, measurement scales

UNIT IV: DATA COLLECTION & ANALYSIS

Types of data, Methods of data collection- From primary sources: observation and recording, interviews structured and unstructured, questionnaire, open ended and close ended questions and the advantages, sampling- Problems encountered in collecting data from secondary sources, introduction to various data analysis techniques

UNIT V: DATA INTERPRETATION & REPORT WRITING

Research writing in general- Components: referencing- writing the bibliography- developing the outline- presentation; etc

TEACHING OUTCOMES

- Creating an interest in the field of research.
- Providing technical knowhow for designing a research method to achieve objectives of a research.
- Providing tools and techniques of sampling and measurements of data.
- Understanding the application of different methods of data collection.
- Providing know how for critical analysis and presentation.
- Expertise in report writing.

Text Books:

1. Research Methodology: Methods and Techniques, C.R Kothari
2. Lecture Notes on Research Methodology, V.P. Saxena

Reference Books:

Case Study Research: Design and Methods, Robert Yin

Course Structure & Syllabus of M.Tech-Construction Engineering & Management Applicable for Batch: 2017-2019

Subject Code	AR-604	Subject Title	Construction Equipment & Management						
LTP	3 0 0	Credit	3	Subject Category		Year	1 st	Semester	I

OBJECTIVE: The course is intended to acquaint the students about construction equipment for various construction activities and equipment management.

UNIT I: EQUIPMENTS FOR EARTHWORK

Fundamentals of Earth Work Operations, Earth Moving Operations, Types of Earth Work Equipment, Tractors, Motor Graders, Scrapers, Front end Loaders – Dozer, Excavators, Rippers, Loaders, trucks and hauling equipment, Compacting Equipment, Finishing equipment.

UNIT II: EQUIPMENTS FOR CONSTRUCTION

Equipment for Dredging, Trenching, Drag line and clamshells, Tunneling – Equipment for Drilling and Blasting - Pile driving Equipment - Erection Equipment - Crane, Mobile crane - Types of pumps used in Construction - Equipment for Dewatering and Grouting – Equipment for Demolition.

UNIT III: MATERIALS HANDLING EQUIPMENTS

Forklifts and related equipment - Portable Material Bins – Material Handling Conveyors – Material Handling Cranes- Industrial Trucks

UNIT IV: ASPHALT & CONCRETE PLANTS

Aggregate production, Different Crushers, Feeders, Screening Equipment, Handling Equipment, Batching and Mixing Equipment, Pumping Equipment, Ready mix concrete equipment, Concrete pouring equipment. Asphalt Plant, Asphalt Pavers, Asphalt compacting Equipment

UNIT V: EQUIPMENT MANAGEMENT

Identification, Planning of equipment, Selection of Equipment, Equipment Management in Projects, Maintenance Management, Equipment cost, Operating cost, Cost Control of Equipment, Depreciation Analysis, Replacement of Equipment

LEARNING OUTCOME: The students should be able to:

- The student will be able to select right type of equipment for construction activities
- The students will be able to understand the management of equipment

Text Books:

- Construction Equipment & Management, S.C Sharma

Reference Books:

1. Managing Construction Equipment, S.W. Nunnally
2. Construction Equipment Guide, David A Day

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Subject Code	AR-605	Subject Title	Environmental Management & Impact Assessment						
LTP	3 0 0	Credit	3	Subject Category		Year	1 st	Semester	I

OBJECTIVE: The course is intended to acquaint the students with the impact of construction activities on environment

UNIT I: ENVIRONMENTAL IMPACT ASSESMENT

Introduction, Definitions & Concepts, Rationale & Historical Development of EIA

UNIT II: COMPONENTS OF EIA

Initial Environment Examination, Environment Impact Statement, Environmental Appraisal, Environmental Impact Factors

UNIT III: EIA PROCESS

- Measurement of environmental impact, organization, scope of pertinent environment factors
- Six generic steps, descriptive checklists, simple interaction matrix, stepped matrix, uniqueness ratio, habitat evaluation system
- Public involvement techniques, comprehensive environmental impact study

UNIT IV: INDIAN SCENARIO

EIA regulations in India, Case study of a large project

UNIT V: ENVIRONMENTAL MANAGEMENT SYSTEMS & STANDARDISATION

- Principles, problems, strategies, Review of political, ecological & remedial actions
- Future Strategies, multidisciplinary environmental strategies
- Introduction to ISO and ISO 14000, EMAS regulations, system based approach

UNIT VI: CARBON TRADING

Energy foot printing, food foot printing and carbon foot printing, carbon credits, CDM

LEARNING OUTCOME: The students should be able to:

CO1: Analyse the adverse effects of construction on surrounding ecological system and society.

CO2: Assess the impact of the project.

CO3: To develop a strategy to manage the impacts of the project.

Text Books:

1. Environmental Impact Assessment by – R.R. Barthwal
2. Environmental Impact Assessment by – P.R. Trivedi

Reference Books:

1. Environmental Impact: Assessment and Analysis by – Emma Layer
2. Introduction To Environmental Impact Assessment by – John Glasson

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SEMESTER II

Course Structure & Syllabus of M.Tech-Construction Engineering & Management Applicable for Batch: 2017-2019

Subject Code	AR-606	Subject Title	Project Formulation & Appraisal						
LTP	4 0 0	Credit	4	Subject Category		Year	1 st	Semester	II

Course Objective:

The intent of the course to acquaint the students with the different phases of project development with specific emphasis on the initiation phases of any construction project.

UNIT I:PROJECT FORMULATION

Project, Concepts, Capital investments, Generation and Screening of Project Ideas, Project identification, Preliminary Analysis, Market, Technical, Financial, Economic and Ecological, Pre-Feasibility Report and its Clearance, Project Estimates and Techno-Economic Feasibility Report, Detailed Project Report, Different Project Clearances required

UNIT II:PROJECT ESTIMATION

Importance of Estimation, Method of Cost Estimating, Parameter Cost Estimating, Cost Capacity Factor, Detailed Cost Estimation, Provision of Escalation, Inflation Provision and Operation of Contingency Provisions

UNIT III:PROJECT COSTING

Project Cash Flows, Time Value of Money, Cost of Capital

UNIT IV:PROJECT APPRAISAL

NPV, BCR, IRR, ARR, Urgency, Pay Back Period, Assessment of Various Methods, Indian Practice of Investment Appraisal, International Practice of Appraisal, Analysis of Risk, Different Methods, Selection of a Project and Risk Analysis in Practice

UNIT V: PRIVATE SECTOR PARTICIPATION

Private sector participation in Infrastructure Development Projects, BOT, BOLT, BOOT Technology Transfer and Foreign Collaboration, Scope of Technology Transfer.

LEARNING OUTCOME:

CO1: Understand the project formulation process.

CO2: Compile the data required for conceptual stage.

CO3: Conduct various surveys for preparation of feasibility report.

CO4: Produce feasibility reports of various project options.

Text Books:

1. **Construction Project Management** – by Col. K.K. Chitkara
2. **Projects** – by Prasanna & Chandra
3. **Construction Management: Theory and Practice** - by Kumar NeerajJha,

Reference Books:

- PMBOOK - A Guide To The Project Management Body Of Knowledge.

Course Structure & Syllabus of M.Tech-Construction Engineering & Management Applicable for Batch: 2017-2019

Subject Code	AR-607	Subject Title	New Building Materials & Technology						
LTP	3 0 0	Credit	3	Subject Category		Year	1 st	Semester	II

OBJECTIVE: The intent of this course to give the knowledge of latest trends in building construction in terms of new building materials and technology used worldwide to meet the demand of current era.

UNIT I: SPECIAL CONCRETE

Concretes, Behaviour of concretes, Properties and Advantages of High Strength and High Performance Concrete, Properties and Applications of Fibre Reinforced Concrete, Self-compacting concrete, Alternate Materials to concrete on high performance & high Strength concrete.

UNIT II: COMPOSITES

Types of Plastics, Properties & Manufacturing process, Advantages of Reinforced polymers, Types of FRP, Applications of FRP.

UNIT IV: NANO TECHNOLOGY IN BUILDING MATERIALS

Types & Differences between Smart and Intelligent Materials, application of nanotechnology in developing of smart building materials.

UNIT V: MATERIALS MANAGEMENT

Necessity and Importance, Objective and Functions of Materials Management, Organization for Materials Management

LEARNING OUTCOME: The students should be able to:

CO1: Understand the characteristic, usages and applications of the new building materials.

CO2: understand the utilization of the modern construction techniques in construction.

Text Books:

Ching, F.D.K., "Building Construction Illustrated", Wiley

Reference Books:

1. Deplazes, A. (Editor), "Constructing Architecture: Materials, Processes, Structures: A Handbook", Birkhäuser
2. Prefabrications by Gary Robins
3. Concrete Folded Plate Roofs by Wilby

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Subject Code	AR-608	Subject Title	Resource Management in Construction						
LTP	3 0 0	Credit	3	Subject Category		Year	1 st	Semester	II

OBJECTIVE: The course is intended to create a capability for the students to conduct academic research.

Unit 1 : RESOURCE PLANNING

- Resource Planning, Procurement, Identification, Personnel, Planning for material, labour, time schedule and cost control, types of resources, manpower, equipment, material, money, time

Unit 2 : LABOUR MANAGEMENT

- Systems approach, characteristics of resources, utilization, and measurement of actual resources required, tools for measurement of resources, labour, classes of labour, cost of labour, labour schedule, optimum use labour.

Unit 3 : MATERIALS AND EQUIPMENT

- Material: time of purchase, quantity of material, sources, transportation, delivery and distribution.
- Equipment: planning and selecting by optimistic choice with respect to cost, time, source and handling.

Unit 4 : TIME MANAGEMENT

- Personnel time, management and planning, managing time on the project, forecasting the future, critical path measuring the changes and their effects – cash flow and cost control.

Unit 5 : RESOURCE ALLOCATION AND LEVELLING

- Time-cost trade off, computer application – resource leveling, resource list, resource allocation, resource loading, cumulative cost – value management.

LEARNING OUTCOME: The students should be able to:

CO1: The students will be able to understand the management of resources at site.

CO2: The students will be able to optimize the allocation of resources for various activities at site.

Text Books:

1. Construction Management & Planning, B. Sengupta & H. Guha
2. Construction Project Management, Harbhajan Singh

Reference Books:

1. PMBOOK - A Guide to the Project Management Body of Knowledge.

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Subject Code	AR-609	Subject Title	Building Contract Administration						
LTP	3 0 0	Credit	3	Subject Category		Year	1 st	Semester	II

LEARNING OBJECTIVES

- Understanding tenders, labour regulations and conditions of contracts.
- Understanding the need and process of arbitration.

UNIT I: CONSTRUCTION CONTRACTS

Indian Contracts Act, Elements of Contracts, Types of Contracts, Features, Suitability, Design of Contract Documents, International Contract Document, Standard Contract Document, Law of Torts

UNIT II: TENDERS

Prequalification, Bidding, Accepting, Evaluation of Tender from Technical, Contractual and Commercial Points of View, Contract Formation and Interpretation, Potential Contractual Problems, World Bank Procedures and Guidelines

UNIT III: ARBITRATION

Comparison of Actions and Laws, Agreements, Subject Matter, Violations, Appointment of Arbitrators, Conditions of Arbitration, Powers and Duties of Arbitrator, Rules of Evidence, Enforcement of Award, Costs

UNIT IV: LEGAL REQUIREMENTS

Insurance and Bonding, Laws Governing Sale, Purchase and Use of Urban and Rural Land, Land Revenue Codes, Tax Laws, Income Tax, Sales Tax, Excise and Custom Duties and their Influence on Construction Costs, Legal Requirements for Planning Property Law, Agency Law, Local Government Laws for Approval, Statutory Regulations

UNIT V: LABOUR REGULATIONS

Social Security, Welfare Legislation, Laws relating to Wages, Bonus and Industrial Disputes, Labour Administration, Insurance and Safety Regulations, Workmen's Compensation Act, Indian Factory Act, Child Labour Act, Other Labour Laws

TEACHING OUTCOMES

- Providing tools for tendering and procurement of personnel.
- Providing tools for dispute resolution.

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Subject Code	AR-610	Subject Title	Computer Applications & Technology						
LTP	2 3 6	Credit	3.5	Subject Category		Year	1 st	Semester	II

LEARNING OBJECTIVES

- Understanding application of IT tools in construction management.
- Understanding application of IT tools in research.

UNIT I: INTRODUCTION

Overview of IT Applications in Construction, Construction process, Computerization in Construction, Computer aided Cost Estimation

UNIT II: USING SOFTWARES IN PROJECT MANAGEMENT

Hands on training on MS Project and Primavera to be provided for the preparation of scheduling of a small construction project

TEACHING OUTCOMES

- Providing know-how of research and analysis tools in MS-Excel
- Providing basic know-how of MS-P or PRIMAVERA P-6.

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SEMESTER III

Course Structure & Syllabus of M.Tech-Construction Engineering & Management Applicable for Batch: 2017-2019

Subject Code	AR-701	Subject Title	Construction Finance Management						
LTP	4 0 0	Credit	4	Subject Category		Year	1 st	Semester	III

Course Objective:

The objective of the course is to familiarise the fundamentals of financial management concepts and their applications in the various phases of the project cycle of construction projects. The course aims to provide a basic knowledge to carry out the financial feasibility of projects, evaluation of project investment decisions.

Unit 1 : BASIC PRINCIPLES

- Time Value of Money – Cash Flow diagram – Nominal and effective interest- continuous interest. Single Payment Compound Amount Factor (P/F,F/P) – Uniform series of Payments (F/A,A/F,F/P,A/P)– Problem time zero (PTZ)- equation time zero (ETZ). Constant increment to periodic payments – Arithmetic Gradient (G), Geometric Gradient (C).

Unit 2 : COMPARING ALTERNATIVES PROPOSALS

- Comparing alternatives- Present Worth Analysis, Annual Worth Analysis, Future Worth Analysis, Rate of Return Analysis (ROR) and Incremental Rate of Return (IROR) Analysis, Benefit/Cost Analysis, Break Even Analysis.

Unit 3 : EVALUATING ALTERNATIVE INVESTMENTS

- Real Estate - Investment Property, Equipment Replace Analysis, Depreciation – Tax before and after depreciation – Value Added Tax (VAT) – Inflation.

Unit 4 : FUNDS MANAGEMENT

- Project Finance – Sources of finance - Long-term and short -term finance, Working Capital Management, Inventory valuation, Mortgage Financing - International financial management- foreign currency management.

Unit 5 : FUNDAMENTALS OF MANAGEMENT ACCOUNTING

- Management accounting, Financial accounting principles- basic concepts, Financial statements – accounting ratios - funds flow statement – cash flow statement.

LEARNING OUTCOME:

CO1: Students will be able to understand the financial implications of infrastructure projects.

CO2: Students will be able to determine the financial feasibility of projects.

CO3: Students will be able to advice on the investments to be made on the projects.

Text Books:

- **Construction Project Management** – by Col. K.K. Chitkara
- **Projects** – by Prasanna & Chandra
- **Construction Management: Theory and Practice** - by Kumar NeerajJha,

Reference Books:

- **A Guide to the Project Management Body of Knowledge: PMBOK Guide**
- **Financial Management in Construction Contracting by** - Andrew Ross, Peter Williams

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Subject Code	AR-702	Subject Title	Risk Management in Construction Business & Projects						
LTP	3 0 0	Credit	3	Subject Category		Year	1 st	Semester	III

OBJECTIVE: This course aims to provide basic understanding of risks associated with the construction projects. Starting with the explanations of the fundamentals of risk and risk managements, the course helps in developing the understanding and analytical approach of handling the risks. The objectives includes:-

- To acquaint the students with the risks associated with the construction projects.

To help students understand the various tools and techniques of risk managements

Unit 1 : Risk in Infrastructure Projects

- Identification of Risks, Specific categories of risk, concept of risk management, Leader's, Developer's and Government's perspective of risk.

Unit 2 : Risk management & its process

- Risk management process, Risk management responsibility, Stages of risk management, Risk response, Risk identification, Brainstorming, Qualitative assessment, Mitigation, Risk analysis.

Unit 3 : Tools and techniques of risk management

- Introduction, Risk register, Risk estimate, MERA, Decision tree, Sensitivity analysis, Influence diagrams, Probability analysis, and Computer software.

Unit 4 : Risk management – Technical procedure

- Introduction, Phases of construction, Post construction risks, Risk matrix, Exhibits

Unit 5 : Project Insurance

- Insurance policy structure, types of insurance, guidance on insurance for construction projects, current condition of contracts, General services provided by the project insurance companies.

LEARNING OUTCOME: The students should be able to:

CO1: Apply the knowledge, skills, and techniques of the discipline.

CO2: Understand the nature, scale and impact of various risks.

CO3: Apply an analytical and logical sequence in thinking risk managements.

Text Books:

1. Kumar NeerajJha, Construction Management: Theory and Practice

Reference Books:

1. PMBOOK - A Guide To The Project Management Body Of Knowledge.

Project Risk Management: Processes, Techniques and Insights - by Chris Chapman and Stephen. Ward.

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Subject Code	AR-703	Subject Title	BOT, Turnkey Projects & FIDIC						
LTP	3 0 0	Credit	3	Subject Category		Year	1st	Semester	III

OBJECTIVE: The objective of this course to acquaint the students with different modes of project delivery & international approaches of project contracting.

Unit 1 : PPP Mode of infrastructure development

- Introduction, Types of agreements, advantages, disadvantages.

Unit 2 : BOT projects

- Introduction (Characteristic, Acceptance criteria, advantages & disadvantages)
- Procurement process, concession period, contractual structure, various agreements under BOT, benefits to government.
- Types of Risk associated
- Other types of BOT project procurement structure – BOOT, BOO, DBO, LOO

Unit 3 : Turnkey Projects

- Introduction – Turnkey model, Characteristic, Advantages and Disadvantages, EPC turnkey projects.
- Phases, Procurement process, Turnkey contracts and agreements.
- Role of client, contractor and suppliers.

Unit 4 : FIDIC

- Introduction, objectives, membership, Statues & Byelaws, Policies, Awards
- FIDIC contracts – The red book, The yellow book, the silver book/ orange book.

LEARNING OUTCOME:The students should be able to:

CO1: The students will be able to understand the role of private sectors in development of public infrastructure projects.

CO2: Students will be able to analyse the importance and complexity of contracts.

Text Books:

- **Construction Project Management** – by Col. K.K. Chitkara
- **Projects** – by Prasanna & Chandra

Reference Books:

- **A Guide to the Project Management Body of Knowledge: PMBOK Guide**
- **The FIDIC form of contract** – by Nael G. Bunni
- **FIDIC Contracts: Law and Practice** – by Ellis Baker, Ben Mellors, Scott Chalmers, Anthony Lavers

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Subject Code	AR-704	Subject Title	Project Quality & Safety						
LTP	3 0 0	Credit	3	Subject Category		Year	1 st	Semester	III

OBJECTIVE: The intent of the course is to give an insight into the concepts of project Quality and safety. The emphasis is to relate quality and safety principles to design development, project management and construction activities.

Unit 1 : INTRODUCTION TO QUALITY

- Understanding the concept of quality, Benchmarking and key performance indicators. Understanding the best practices on construction sites.

Unit 2 : QUALITY MANAGEMENT

- Understanding quality assurance and quality control. Learning international best practices and certifications in the field of quality. Preparation of manuals and checklists.

Unit 3 : SAFETY MANAGEMENT

- Understanding the concept and importance of safety. Cost of safety. Assessment of risks and hazards. Planning for safety.

Unit 4 : ENSURING SAFETY AT CONSTRUCTION SITES

- Safety Planning, monitoring and formulation of safety instructions for a construction site. Site specific safety guidelines.

LEARNING OUTCOME: The students should be able to:

CO1: Students will be able to evaluate the modern concepts of quality systems and quality control

CO2: Students will be able to take general precautions for avoiding accidents on construction site.

Text Books:

- **Construction Project Management** – by Col. K.K. Chitkara
- **Projects** – by Prasanna & Chandra

Reference Books:

- **A Guide to the Project Management Body of Knowledge: PMBOK Guide.**
- **Construction Quality Management** – by Siu-lam Tang, Syed M. Ahmed, Raymond T. Aoieong, S.W. Poon.

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Subject Code	AR-705	Subject Title	Construction Projects Case Study						
LTP	5 0 0	Credit	5	Subject Category		Year	1 st	Semester	III

OBJECTIVE: The intent of the course is to give knowledge of the latest trends in construction industry in terms of materials, equipment, techniques and technology.

Unit 1 :

- A case study of a live construction project throughout the semester and submitting the weekly report.
- Emphasis should be given on site management, construction activities, project scheduling and resource management.
- Weekly submission can be in form of series of seminars/ presentations by the students.
- The final submission at the end of the semester will be in form of report which will be the summation of weekly submissions.
- Live construction site visits on weekly basis and compilation of data through notes, pictures, videos, interviews of the construction team etc taken during all the site visits.

LEARNING OUTCOME: The students should be able to:

CO1: Students will be able to grasp the knowledge through running projects for better understanding.

CO2: Students will be able identify different types of activities and events.

CO3: Students will be able form a logical sequencing of different activities and events.

Text Books:

Reference Books:

Course Structure & Syllabus of M.Tech-Construction Engineering & Management Applicable for Batch: 2017-2019

Subject Code	AR-741	Subject Title	Departmental Elective – 3 (Construction & Project Account)						
LTP	3 0 0	Credit	3	Subject Category		Year	1 st	Semester	III

OBJECTIVE: This course provides students with an understanding of basics of accounting of construction projects.

Unit 1 :

Introduction: Introduction to Management accounting, concept of control, status, role and scope of the management accounting, relationship between management accounting and top-level management, Break-Even Analysis

Unit 2 :

Accounting Mechanism: Accounting Mechanism & accounting practices in India. Preparation of financial statements, Accounting policies with special reference to revenue recognition, matching expenses and revenue & depreciation accounting.

Unit 3 :

Accounting types: Inflation accounting, creative accounting, social accounting and social audit. **Financial statement and their analysis:** Understanding of financial statement and their analysis, like Balance Sheet, Profit & Loss Account, ratio analysis, fund flow analysis, statement of changes in financial position.

Unit 4 :

Statutory requirements: Statutory requirements for accounting and auditing. **Corporate reporting:** Corporate reporting practices in India.

LEARNING OUTCOME: The students should be able to:

CO1: Understand various aspects of management accounting in construction business and

CO2: Provide knowledge about the coordination of management accounting information for corporate financial decision making.

Text Books:

- Accounting for management; By Bhattacharya, S.K. and John Dearden, Publisher – Vikar, New Delhi.
- Management Accounting & Financial Analysis, By Khan & Jain, Publisher – Tata McGraw Hill.

Reference Books:

- Blank, L. T. and Tarquin, A. J., "Engineering Economy", Fourth Edition, WCB/McGraw-Hill, 1998.
- Bose, D. C., "Fundamentals of Financial management", 2nd ed., PHI, New Delhi, 2010.

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Subject Code	AR-742	Subject Title	Departmental Elective – 3 (Laws Governing Infrastructure Projects)						
LTP	3 0 0	Credit	3	Subject Category		Year	1 st	Semester	III

OBJECTIVE: The intent of this course is to acquaint the students with the various legal and regulatory framework governing the infrastructure projects in India.

Unit 1 : Legal and Policy Aspects

Constitutional aspects

Constitutional law-allocation of jurisdiction over different infrastructure sectors between the Centre and State - law making powers Administrative Law

Policy Formulation

Role of Centre and State in policy formulation – Central funding of infrastructure projects – central oversight and interference.

Private Participation

Investment requirements – non ideological factors leading to commercialisation and privatisation of infrastructure- from socialism to market driven economy- legal framework for private sector participation – modes of Public Private Partnership (PPP)- dispute settlement clauses in concession agreements.

Unit 2 : General legal context of infrastructure business

Environmental Aspects

General Framework on environmental regulation and guidelines- Coastal Zone Regulation- Forest (Conservation)

Act -Environmental Impact Assessment Role of judiciary

Land Acquisition

Land Acquisition – Rehabilitation and resettlement

Unit 3 :

Introduction: Law and the Common man, Consumer protection Act, Legal Systems in India.

Indian Contract Act, 1872: Provisions of Contract Act, Important clauses of the Act.

Unit 4 :

Arbitration & Reconciliation Act, 1996.

Labor Acts related to construction activity: Payment of wages Act, Contract Labour Act, Minimum Wages Act, Employees' State Insurance Act, and Workmen 's Compensation Act.

LEARNING OUTCOME: The students should be able to:

After successful completion of this course, student shall be able to: Acquaint with relevant Acts & Laws related to construction projects in India.

Text Books:

- Law Relating To Infrastructure Projects Paperback – 2003 by Piyush Joshi.

Reference Books:

- Administrative Law , Lucknow: Eastern Book Company by I.P Massey
- The Constitutional Law of India, New Delhi: Lexis Nexis Butterworths by D DBasu

Course Structure & Syllabus of M.Tech-Construction Engineering & Management Applicable for Batch: 2017-2019

Subject Code	AR-744	Subject Title	Departmental Elective – 4 (Construction Marketing Management)						
LTP	3 0 0	Credit	3	Subject Category		Year	1 st	Semester	III

OBJECTIVE: This course provides students with an understanding of marketing strategies related to construction projects.

Unit 1 : Marketing environment:

Impact of internal and external environment, socio-economic, demographic, political, technological and legal environment, nature and impact of competition, marketing strategy

Unit 2 : Basics of marketing:

Features of marketing of consumer goods, industrial products and services, product and marketing, marketing organization structures, societal role of marketing

Unit 3 : Marketing projects:

Characteristics of construction projects, sources of information, pre-qualification documents, bid preparation – estimating, provision for overheads and profit, bidding models, bidding strategy, pre-bid meetings, negotiation, legal aspects, impact of joint ventures, collaborations and alliances, impact of globalization and privatization, strategies for project export.

Unit 4 : Marketing real estate:

Characteristics of real estate, demand and supply relationship, segmentation, product mix, pricing strategies, advertising strategies, legal aspects

Unit 5 : Marketing products for construction:

Characteristics of construction materials and equipment, strategies for marketing of materials and equipment for construction, demand surveys, advertising strategies, communication, exhibitions and product demonstrations, pricing strategies, financing arrangements

LEARNING OUTCOME: The students should be able to:

CO1: Understand the importance and basics of marketing.

CO2: Understand the characteristics of construction projects and real estate.

CO3: Understand the strategies for marketing of materials & equipment.

Text Books:

Marketing and the laws - by M.A. Sujan and Haish Sujan

Reference Books:

Market Management and Project Business Development 1st Edition - by Hedley Smyth

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Subject Code	AR-745	Subject Title	Departmental Elective – 4 (Site Management)						
LTP	3 0 0	Credit	3	Subject Category		Year	1 st	Semester	III

OBJECTIVE: The intent of this course is to provide students with an understanding of managerial skills required to handle the construction site.

Unit 1 :

- Terminology, methodology of design of the construction site operations and site facilities.
- Logistic and technology schemes.

Unit 2 :

- Planning and documentation of the site facilities.
- Production facilities of the construction site.

Unit 3 :

- Operation facilities of the construction site.
- Social and sanitary facilities of the construction site.

Unit 4 :

- Fire safety and protection of the construction site facilities.
- Health safety and protection of the employees.

Unit 5 :

- Provisions on the protection of the environment in plan of the construction site.
- Pre-construction planning in Building Information Modelling (BIM)
Planning and construction according to BREEAM, LEED, etc.

LEARNING OUTCOME: The students should be able to:

CO1: Understand the principles of the design of a site operations.

CO2: Utilize the methodology of facility planning focused on individual operations.

CO3: Aware of provisions on fire safety, protection of environment, health & safety protection

Text Books:

Security and Site Design by - Leonard Hopper and Martha Droge

Reference Books:

The A to Z of Practical Building Construction and Its Management Hardcover– 2017 by Sandeep Mantri.

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Subject Code	AR-706	Subject Title	Thesis Project						
LTP	0 0 6	Credit	12	Subject Category		Year	1 st	Semester	IV

OBJECTIVE: The objective of the thesis is to provide an opportunity to the students to prepare independent and original study of a special project of his own choice.

Unit 1 :

The subject for special study may be conceptual or practical but pertaining to Building Engineering and Management. This should however, offer scope to adopt a fresh approach in formulating a concept or developing a methodology effective and useful. Each student will prepare the Thesis under the guidance of a principal advisor with regular reviews by the faculty of the department. The Thesis will be presented in the accepted form of a thesis report duly supported by copious References, sketches, graphs, statistical data, details of survey if any, detailed account of experimental / analytical procedures adopted. Each student is required to defend his Thesis at a Viva Voce Examination by jury.

The suggested thesis topic may be as following:

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Building Engineering 2. Construction technology 3. Structural systems 4. Energy efficient building materials & techniques 5. Construction project management 6. Time management 7. Cost management 8. Quality management 9. Safety management 10. Contract Administration | <ol style="list-style-type: none"> 11. Design management 12. Construction financial management 13. Human resource management 14. Quantitative techniques 15. Energy management 16. Building services 17. Building management systems 18. Infrastructure services 19. Management information systems 20. Project planning and feasibility 21. Disaster management |
|---|---|

LEARNING OUTCOME: The students should be able to:

CO1: Students will be able to work individually on a project

CO2: Students will be able to evaluate his/ her potential and limitations to carry out a project independently.

Text Books:

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Reference Books:

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Subject Code	AR-707	Subject Title	Real Estate Management						
LTP	2 0 0	Credit	2	Subject Category		Year	1 st	Semester	IV

OBJECTIVE: Intent of the course is to impart detailed knowledge of all aspects related to management of Real Estate projects to train the students as Real Estate Project Managers. Students are expected to comprehend interests of various stakeholders and build understanding to discharge appropriate functions.

Unit 1 : REAL ESTATE SCOPE

- **Classification of real estate activities and peculiarities; Role, scope, working characteristics and principal functions of real estate participants and stakeholders;**

- **Factors affecting real estate market; Role of Government in real estate market; Statutory provisions, laws, rules and regulations application, land use controls in property development, registration and licensing requirements; Appraisal of Real Estate development projects; Real Estate financing; REIT**

Unit 2 : URBAN ECONOMICS

- **Land as a factor of production, land rent, land use problems, location decisions**
- **Introduction to building economics; The Economic context: Materials, Labour, Capital; Economic aspects of design decisions; The Initial Cost of Building Projects; Construction Cost; Financing Construction Projects.; The Future Performance of Buildings: Cost-In-Use; Life Cycle Cost; Benefits and Value of Buildings; Measures of Economic Performance; Techniques of Economic performance analysis for building projects;**

Unit 3 : FUNCTIONS OF REAL ESTATE DEVELOPMENT

- **Functions of Real Estate development; Project formulation; Feasibility studies; Developing Costing and financing; Planning, scheduling and monitoring of real estate projects; Marketing/advertising; Risk management; Documentation in real estate processes;**

- **Transaction management; Transfer of titles and title records; Real Estate appraisal and valuation;**

Unit 4 : REAL ESTATE CONSULTANT AND THEIR ACTIVITIES

- **Types of agreements between the consultants and principal; Knowledge base for assessment and forecasting the Real Estate market; Real Estate investment, sources and related issues; Code of ethics for Real Estate participants; Environmental issues related to Real Estate transactions; Closing the Real Estate transactions.**

LEARNING OUTCOME: The students should be able to:

CO1: Students will be able to understand the characteristic of real estate market.

CO2: Students will be able to understand the process of demand and supply of the market through various concepts of real estate management.

Text Books:

- **Stapleton's Real Estate management Practice** by - Anthony Banfield
- **Principles of Real Estate Managements** by - Anthony Downs

Reference Books:

- **Corporate Real Estate Asset Management** by – Barry Haynes, Nick Nunnington

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Subject Code	AR-747	Subject Title	Departmental Elective – 5 (BIM for Construction Management)						
LTP	3 0 0	Credit	3	Subject Category		Year	1 st	Semester	III

OBJECTIVE: This course provides students with an understanding of the software used in construction project management for scheduling called BIM (Building Information Modelling)

Unit 1 : Design Phase application

- Schematic Design
- Detail Design
- Training
- Energy Analysis
- Marketing

Unit 2 : Construction Phase application

- Site Planning & Logistics
- Schedule/Work Sequence Simulation
- Quantity Take Off
- Clash Detection
- Marketing
- Shop Drawing
- Project Control
- Construction Project Modeling
- Training

Unit 3 : Operation & Maintenance Phase Application

- Asset Management
- Renovation Prioritization

LEARNING OUTCOME: The students should be able to:

CO1: Understand the application of the BIM at various phases of construction project.

CO2: Utilize the acquired knowledge and skills for the scheduling of a new project.

CO3: Apply the acquired skills to analyze and modify the scheduling of any current project.

Text Books:

McGraw Hill Construction SmartMarket Report “The Business Value of BIM: Getting Building Information Modeling to the Bottom Line” (2009).

Reference Books:

Eastman, C., Teicholz, P., Sacks, R., & Liston, K. (2008). BIM handbook: A guide to building information modeling for owners, managers, designers, engineers, and contractors. Hoboken, N.J: Wiley.

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Subject Code	AR-748	Subject Title	Departmental Elective – 5 (Infrastructure Development Through PPP Mode)						
LTP	3 0 0	Credit	3	Subject Category		Year	1 st	Semester	III

OBJECTIVE: The intent of the course is to introduce students to basic concepts related to infrastructure development with an aim for developing expertise in effective management of infrastructure challenges across the country. The focus is on imparting knowledge and skills required for planning, management, and effective delivery of large-scale infrastructure projects through PPP.

Unit 1 :

Overview of infrastructure sector; Introduction to infrastructure business; Study of various types of infrastructure; Evolution and growth of infrastructure; Models on infrastructure development; Government's initiatives in infrastructure; Initiatives in 5-year plans;

Unit 2 :

Infrastructure Policy & Regulation; Land procurement; Project clearances; Appraisal of techno-legal and regulatory aspects of infrastructure;
Infrastructure Project Feasibility - Appraisal and Due Diligence; Life Cycle perspective of infrastructure; Social benefits of infrastructure development; Integrated impact assessment; Infrastructure project finance;

Unit 3 :

Infrastructure procurement and Project Implementation approach - SPVs & PPPs; Bidding systems; concession agreements, selection procedures of concessionaires; issues in financial closure, stakeholder management

Unit 4 :

Infrastructure Project Finance Management; Financial Models; Infrastructure Project planning and management; Strategic planning; Risk analysis techniques; Typical DPR Structures; Study case examples on different infrastructure types.

Unit 5 :

Environmental Impact Assessment; Case studies of infrastructure projects.

LEARNING OUTCOME: The students should be able to:

CO1: The students will be able to understand the Inventory management information system.

CO2: The students will be able to understand Stock control

CO3: The students will be able to forecast the demand and planning operations.

Text Books:

- Infrastructure Development & the Role of Public-Private-Partnership (PPP) Hardcover – Import, 3 Aug 2017 - by Professor G Satyanarayana.

Reference Books:

Public Private Partnerships: A Global Review (Cib) Hardcover – Import, 15 Sep 2015 - by Akintola Akintoye (Editor), Matthias Beck (Editor), Mohan Kumaraswamy (Editor)