1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

Graduates of the programme M E Construction Engineering & Management will

PEO1 Excel in research or will succeed in Construction Engineering and Management profession in the government, public and private sector organizations.

PEO2 Have a sound knowledge in statistics, project management and construction engineering fundamentals required for solving real time construction Engineering and Management problems using modern equipment and software tools.

PEO3 Become entrepreneurs and develop processes and construction technologies through innovation, by integrating their knowledge in multidisciplinary management to meet the needs of society and formulate solutions that are technically sound, economically feasible, and socially acceptable.

PEO4 Have professional and ethical attitude, effective communication skills, teamwork skills, leadership quality, multidisciplinary approach and an ability to relate Construction Engineering and Management issues in broader social context.

PEO5 Have competence of excellence, leadership, written ethical codes and guidelines, and the life-long learning needed for a successful professional career.

2. PROGRAMME OUTCOMES (POs):

POs describe what students are expected to know or be able to do by the time of post-graduation from the program. The Program Outcomes of M.E Construction Engineering and Management are as follows:

The students will able to

PO1: An ability to independently carry out research/investigation and development work to solve practical problems.

PO2: An ability to write and present a substantial technical report/document.

PO3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

<table>
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<tr>
<th>Pos</th>
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3. PROGRAM SPECIFIC OUTCOMES (PSOs):

Graduates of the program M.E. Construction Engineering and Management will be able to

| PSO1 | Knowledge of Construction Engineering and Management discipline | In-depth knowledge in the construction management, engineering and technologies necessary to formulate, plan, schedule and execute construction projects. |
| PSO2 | Critical analysis of Construction management problems and innovation | Critically analyze and solve construction engineering and management problems by applying the modern tools and concepts of Construction Engineering & Management and make innovative advances in theoretical and practical. |
| PSO3 | Conceptualization and evaluation of engineering solutions to Construction Issues | Conceptualize the problems in construction industry and develop appropriate solutions which are technically feasible and economically viable with due consideration of sustainability. |

PEO / PO Mapping:

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Note: The table above represents the mapping of course outcomes to programme outcomes. Each cell indicates the weightage of the course outcome towards the programme outcome.
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### ANNA UNIVERSITY, CHENNAI
NON-AUTONOMOUS AFFILIATED COLLEGES
M. E. CONSTRUCTION ENGINEERING AND MANAGEMENT
REGULATIONS 2021
CHOICE BASED CREDIT SYSTEM
I TO IV SEMESTERS CURRICULA AND SYLLABUS

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### SEMESTER IV

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**TOTAL CREDITS: 70**

### FOUNDATION COURSES (FC)

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### LIST OF PROFESSIONAL ELECTIVE COURSES [PEC]

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### RESEARCH METHODOLOGY AND IPR COURSES (RMC)

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**TOTAL CREDITS** 21

### AUDIT COURSES (AC)

Registration for any of these courses is optional to students

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OBJECTIVES:
- This course is designed to provide the solid foundation on topics in various statistical methods which form the basis for many other areas in the mathematical sciences including statistics, modern optimization methods and risk modeling. It is framed to address the issues and the principles of estimation theory, testing of hypothesis, correlation and regression, design of experiments and multivariate analysis.

UNIT I ESTIMATION THEORY 12

UNIT II TESTING OF HYPOTHESIS 12
Sampling distributions - Small and large samples - Tests based on Normal, t, Chi square, and F distributions for testing of means, variance and proportions – Analysis of r x c tables – Goodness of fit.

UNIT III CORRELATION AND REGRESSION 12
Multiple and partial correlation – Method of least squares – Plane of regression – Properties of residuals – Coefficient of multiple correlation – Coefficient of partial correlation – Multiple correlation with total and partial correlations – Regression and partial correlations in terms of lower order coefficients.

UNIT IV DESIGN OF EXPERIMENTS 12
Analysis of variance – One way and two way classifications – Completely randomized design – Randomized block design – Latin square design - 2^2 Factorial design.

UNIT V MULTIVARIATE ANALYSIS 12
Random vectors and matrices – Mean vectors and covariance matrices – Multivariate normal density and its properties – Principal components: Population principal components – Principal components from standardized variables.

TOTAL: 60 PERIODS

OUTCOMES:
After completing this course, students should demonstrate competency in the following topics:
- Consistency, efficiency and unbiasedness of estimators, method of maximum likelihood estimation and Central Limit Theorem.
- Use statistical tests in testing hypotheses on data.
- Concept of linear regression, correlation, and its applications.
- List the guidelines for designing experiments and recognize the key historical figures in Design of Experiments.
- Perform exploratory analysis of multivariate data, such as multivariate normal density, calculating descriptive statistics, testing for multivariate normality.

The students should have the ability to use the appropriate and relevant, fundamental and applied mathematical and statistical knowledge, methodologies and modern computational tools.

REFERENCES:
CN4101 MODERN CONSTRUCTION MATERIALS 

L T P C
3 0 0 3

OBJECTIVE:

- To study and understand the properties of modern construction materials used in construction such as special concretes, metals, composites, water proofing compounds, non-weathering materials, and smart materials.

UNIT I STRUCTURAL MATERIALS 9

UNIT II NON-STRUCTURAL MATERIALS, ASSOCESSORIES AND FINISHES 9

UNIT III COMPOSITES 9
Types of Plastics – Polymer - Properties & Manufacturing process – Advantages of Reinforced polymers – Types of FRP – FRP on different structural elements – Applications of FRP - Bituminous Materials - Glass - Closure - Environmental Concerns.

UNIT IV SPECIAL CONCRETES 9
Concretes - Behavior of concretes – Properties and Advantages of High Strength and High Performance Concrete – Properties and Applications of Fibre Reinforced Concrete, Self-compacting concrete, Geo Polymer Concrete, Alternate Materials to concrete on high performance & high Strength concrete.

UNIT V SMART AND INTELLIGENT MATERIALS 9
Types & Differences between Smart and Intelligent Materials – Special features – Nano Concrete - Nano Technology in Construction - Case studies showing the applications of smart & Intelligent Materials.

OUTCOMES:

- On completion of the course, the student is expected to be able to

  CO1 Explain the various types of special concretes
  CO2 Select the different processing of steel and applications of coating
  CO3 Explain the manufacturing process and applications of polymer composites
  CO4 Identify the different flooring materials and application of façade materials
  CO5 Apply the knowledge of smart and intelligent materials in construction field

REFERENCES:

OBJECTIVE:

- To study and understand the formulation, and costing of construction projects, appraisal, finance, and private sector participation.

UNIT I  PROJECT FORMULATION  12

UNIT II  PROJECT COSTING  12

UNIT III  PROJECT APPRAISAL  12

UNIT IV  PROJECT FINANCING  12

UNIT V  PRIVATE SECTOR PARTICIPATION  12
Private sector participation in Infrastructure Development Projects - BOT, BOLT, BOOT-Technology Transfer and Foreign Collaboration - Scope of Technology Transfer.

TOTAL: 60 PERIODS

OUTCOME:

- On completion of the course, the student is expected to be able to

  | CO1 | Perform Formulations Of Projects |
  | CO2 | Analyze Project Costing |
  | CO3 | Evaluate Project Appraisal |
  | CO4 | Apply Project Financing |
  | CO5 | Perform Private Sector Participation & Implementation |
REFERENCES:

CO – PO Mapping - PROJECT FORMULATION AND APPRAISAL

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CN4103 CONSTRUCTION EQUIPMENT AND MANAGEMENT L T P C

3 0 0 3

OBJECTIVE:
- To study and understand the various types of equipments used for earthwork, tunneling, drilling, blasting, dewatering, material handling conveyors and its applications in construction projects.

UNIT I CONSTRUCTION EQUIPMENT SELECTION

UNIT II EQUIPMENT FOR EARTHWORK

UNIT III OTHER CONSTRUCTION EQUIPMENT

UNIT IV ASPHALT AND CONCRETING EQUIPMENT

UNIT V MATERIALS HANDLING EQUIPMENT
Forklifts and related equipment - Portable Material Bins – Material Handling Conveyors – Material Handling Cranes- Industrial Trucks.

TOTAL: 45 PERIODS
OUTCOME:
- On completion of the course, the student is expected to be able to
  
  CO1 Develop knowledge on the planning of equipment and selection of equipment
  CO2 Explain the knowledge on fundamentals of earth work operations, earth moving operations and types of earth work equipment
  CO3 Develop the knowledge on special construction equipments
  CO4 Apply the knowledge on asphalt and concrete plants
  CO5 Apply the knowledge and select the proper materials handling equipment

REFERENCES:
5. Sharma S.C. Construction Equipment and Management, Khanna Publishers, New Delhi, 2019

CO – PO Mapping - CONSTRUCTION EQUIPMENT AND MANAGEMENT

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RM4151 RESEARCH METHODOLOGY AND IPR

UNIT I RESEARCH DESIGN
Overview of research process and design, Use of Secondary and exploratory data to answer the research question, Qualitative research, Observation studies, Experiments and Surveys.

UNIT II DATA COLLECTION AND SOURCES
Measurements, Measurement Scales, Questionnaires and Instruments, Sampling and methods.
Data - Preparing, Exploring, examining and displaying.

UNIT III DATA ANALYSIS AND REPORTING
Overview of Multivariate analysis, Hypotheses testing and Measures of Association. Presenting Insights and findings using written reports and oral presentation.

UNIT IV INTELLECTUAL PROPERTY RIGHTS
UNIT V  PATENTS

TOTAL :30 PERIODS

REFERENCES

ST4161 ADVANCED CONSTRUCTION ENGINEERING AND EXPERIMENTAL TECHNIQUES LABORATORY
L  T  P  C
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A) ADVANCED CONSTRUCTION ENGINEERING LABORATORY

OBJECTIVE:
- To provide a thorough knowledge of material selection through the material testing based on specification

LIST OF EXPERIMENTS
1. Mix design of concrete as per IS, ACI & BS methods for high-performance concrete.
3. Effect of minerals and chemical admixtures in concrete at fresh and hardened state with relevance to workability, strength, and durability.
4. NDT on hardened concrete - UPV, Rebound hammer, and core test.
5. Permeability test on hardened concrete (RCPT) – Demonstration

TOTAL:30 PERIODS

OUTCOMES:
On completion of the course, the student will be able to

CO1 Do the mix proportion using IS and ACI codal provisions.
CO2 Analyse the flow characteristics of SCC
CO3 Analyse the effect of mineral and Chemical Admixtures
CO4 Test the concrete in a non-destructive manner using a rebound hammer.
CO5 Know the permeability characteristics of concrete.

B) EXPERIMENTAL TECHNIQUES LABORATORY

OBJECTIVE:
- To provide a detailed account of modern experimental techniques in construction Engineering research.
- To introduce the basic working principles, the operational know how, and the strength and limitations of the techniques.
LIST OF EXPERIMENTS
1. Determination of elastic constants – Hyperbolic fringes
2. Determination of elastic constants – Elliptical fringes
3. Strain gauge meter – Determination of Young’s modulus of a metallic wire
4. Ultrasonic interferometer – ultrasonic velocity in liquids
5. Electrical conductivity of metals and alloys with temperature-four probe method
6. Resistivity measurements
7. NDT – Ultrasonic flaw detector
8. Calibration of Proving Ring and LVDT

TOTAL : 30 PERIODS

OUTCOMES:
- On completion of the course, the student is expected to be able to

CO1 Apply the experimental methods to correlate with the theory.
CO2 Learn the usage of electrical systems for various measurements.
CO3 Learn the usage of optical systems for various measurements.
CO4 Analyse of Data and interpretation
CO5 Apply the analytical techniques and graphical analysis to interpret the experimental data

CO – PO Mapping - ADVANCED CONSTRUCTION ENGINEERING AND EXPERIMENTAL TECHNIQUES LABORATORY

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CN4111 TECHNICAL SEMINAR

OBJECTIVE:
- To work on a specific technical topic in Construction Engineering and Management in order to acquire the skills of oral presentation and to acquire technical writing abilities for seminars and conferences.

SYLLABUS: The students will work for two hours per week guided by a group of staff members. They will be asked to talk on any topic of their choice related to construction engineering and management and to engage in dialogue with the audience. A brief copy of their talk also should be submitted. Similarly, the students will have to present a seminar of not less than fifteen minutes and not more than thirty minutes on the technical topic. They will also answer the queries on the topic. The students as audience also should interact. Evaluation will be based on the technical presentation and the report and also on the interaction during the seminar.

OUTCOME:
- CO1 Identify latest developments in the field of Construction Engineering
- CO2 Identify latest developments in the field of Construction Management
- CO3 Presentation Skills and ability to answer the queries during Interaction
- CO4 Acquire technical writing abilities for seminars, conferences and journal publications
- CO5 Use modern tools to present the technical details
OBJECTIVE:

- To study and understand the latest construction techniques applied to engineering construction for substructure, superstructure, special structures.
- To gain the knowledge about the rehabilitation and strengthening techniques.
- To learn about the various demolition techniques.

UNIT I  SUB STRUCTURE CONSTRUCTION

- Box jacking
- Pipe jacking
- Under water construction of diaphragm walls and basement
- Tunneling techniques
- Piling techniques
- Driving well and caisson
- sinking cofferdam
- cable anchoring and grouting
- Driving diaphragm walls
- Sheet piles
- Laying operations for built up offshore system
- Shoring for deep cutting
- Large reservoir construction
- well points
- Dewatering for underground open excavation.

UNIT II  SUPER STRUCTURE CONSTRUCTION FOR BUILDINGS

- Vacuum dewatering of concrete flooring
- Concrete paving technology
- Techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections
- Erection techniques of tall structures
- Large span structures
- launching techniques for heavy decks
- In-situ prestressing in high rise structures
- Post tensioning of slab
- Aerial transporting
- Handling and erecting lightweight components on tall structures.

UNIT III  CONSTRUCTION OF SPECIAL STRUCTURES

- Erection of lattice towers
- Rigging of transmission line structures
- Construction sequence in cooling towers
- Silos, chimney, and sky scrapers
- Bow string bridges
- Cable stayed bridges
- Launching and pushing of box decks
- Construction of jetties and break water structures
- Construction sequence and methods in domes
- Support structure for heavy equipment and machinery in heavy industries
- Erection of articulated structures and space decks.

UNIT IV  REHABILITATION AND STRENGTHENING TECHNIQUES

- Seismic retrofitting
- Strengthening of beams, columns, slab and masonry wall
- Protection methods of structures
- Mud jacking and grouting for foundation
- Micro piling and underpinning for strengthening floor and shallow profile
- Sub grade water proofing
- Soil Stabilization techniques.

UNIT V  DEMOLITION

- Demolition Techniques
- Demolition by Machines
- Demolition by Explosives
- Advanced techniques using Robotic Machines
- Demolition Sequence
- Dismantling Techniques
- Safety precaution in Demolition and Dismantling.

TOTAL: 45 PERIODS
OUTCOME:
- On completion of the course, the student is expected to be able to
  CO1 Classify the modern construction techniques used in the sub structure construction.
  CO2 Demonstrate knowledge and understanding of the principles and concepts relevant to super structure construction for buildings
  CO3 Summarize the concepts used in the construction of special structures
  CO4 Distinguish Various strengthening and repair methods for different cases.
  CO5 Identify the suitable demolition technique for demolishing a building.

REFERENCES:
2. Concrete Structures: Repair, Rehabilitation and Strengthening, Dr. Mohamed A. El-Reedy, 2020

CO – PO Mapping - ADVANCED CONSTRUCTION TECHNIQUES

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CN4202 CONSTRUCTION PLANNING, SCHEDULING, AND CONTROL         L T P C
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OBJECTIVE:
- To study and understand the concept of planning.
- To impart concepts in Network representation and analysis.
- To impart concepts in Precedence Network analysis.
- To impart concepts in resource scheduling.
- To learn Concepts in project monitoring and controlling

UNIT I CONSTRUCTION PLANNING

UNIT II NETWORK REPRESENTATION AND ANALYSIS
UNIT III  PRECEDENCE NETWORK ANALYSIS

UNIT IV  SCHEDULING PROJECT WORK AND RESOURCE SCHEDULING

UNIT V  PROJECT MONITORING AND CONTROLLING

TOTAL: 45 PERIODS

OUTCOME:
• On completion of the course, the student is expected to be able to
  CO1 Identify and estimate the activity in the construction.
  CO2 Schedule the networking of activities using the critical path method.
  CO3 Evaluate the project budget required for the particular construction project.
  CO4 Recognize the various quality control tool required in the construction industry.
  CO5 Explain the different databases that can be maintained in the construction industry using computers.

REFERENCES:

CO – PO Mapping - CONSTRUCTION PLANNING, SCHEDULING AND CONTROL

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CN4203  CONTRACT LAWS AND REGULATIONS

OBJECTIVE:
• To study the various types of construction contract and their legal aspects and provisions..
• To learn concepts in Tenders.
• To learn concepts in Arbitration and legal requirements
• To study the concepts in labour regulations.
UNIT I CONSTRUCTION CONTRACTS 9
Torts.

UNIT II TENDERS 9
Prequalification – Bidding – Accepting – Evaluation of Tender from Technical, Contractual and
Commercial Points of View – Contract Formation and Interpretation – Potential Contractual

UNIT III ARBITRATION 9
Comparison of Actions and Laws – Agreements – Subject Matter – Violations – Appointment of
Enforcement of Award – Costs.

UNIT IV LEGAL REQUIREMENTS 9
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

UNIT V LABOUR REGULATIONS 9
Social Security – Welfare Legislation – Laws relating to Wages, Bonus and Industrial Disputes,
Labour Administration – Insurance and Safety Regulations – Workmen’s Compensation Act – Indian

TOTAL: 45 PERIODS

OUTCOME:
• On completion of the course, the student is expected to be able to

CO1 Design the construction contracts
CO2 Develop a skill for the tendering process.
CO3 Explain the duties of the arbitrator.
CO4 Develop an idea on the various legal requirements to be met in relation to
land and construction.
CO5 Identify and apply the provisions provided in the labour welfare schemes.

REFERENCES:
   Edition, 2021

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CN4211  CONSTRUCTION MANAGEMENT STUDIO LABORATORY  L T P C  0 0 4 2

OBJECTIVE:
- To train the students in utilizing the sophisticated spreadsheets programs,
- To train the students to handle estimation software.
- To train the students to handle the Project management software.

LIST OF EXPERIMENTS
1. Scheduling of a small construction project using Primavera scheduling systems including reports and tracking.
2. Scheduling of a small construction project using tools like MS project scheduling systems including reports and tracking.
3. Simulation models for project risk analysis.
4. Virtual progress tracking of small construction project using Navisworks
5. Model a simple building project using Building Information Modelling (BIM)

TOTAL: 60 PERIODS

OUTCOME:
- On completion of the course, the student is expected to be able to
  CO1 Prepare the proposal for a construction project
  CO2 Store and retrieve information about the equipments.
  CO3 Track the activities and schedule a construction project using PRIMAVERA
  CO4 Track and schedule a construction project using MS Project.
  CO5 Develop a simulation model for analysing the project risk

CO – PO Mapping - CONSTRUCTION MANAGEMENT STUDIO LABORATORY

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CN4212  STATISTICAL ANALYSIS FOR CONSTRUCTION ENGINEERS LABORATORY  L T P C  0 0 4 2

OBJECTIVE:
- To provide hands on training in basic spread sheet software.
- To provide hands on training in advanced spread sheet software.
- To provide hands on training in data analytical tools.

LIST OF EXPERIMENTS:
1. Descriptive Statistics: frequency distribution, Applications (Charts, Graphs etc.)
2. Use of statistical packages Correlation, ANOVA , Cross Tabulation, t-Test and Simple and Multiple Regression
3. Solving Linear Programming Problems, Transportation and Assignment Models
4. Solving Network Flow Models
5. Solving Decision making Problems in Project Management

TOTAL: 60 PERIODS
OUTCOME:
- On completion of the course, the student is expected to be able to

CO1 Formulate descriptive statistics with charts and graphs using spreadsheet softwares and interpretation of results
CO2 Analyse construction management field data using Statistical tools.
CO3 Solve Linear Programming Problems, transportation and assignment problems by appropriate techniques and evaluate the behaviour under different range of parameters
CO4 Perform network analysis and decision making in project management
CO 5 Solve Construction management problems using decision making tool.

CO – PO Mapping - Statistical Analysis for Construction Engineers Laboratory

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CN4311 PRACTICAL TRAINING (4 Weeks) L T P C

OBJECTIVE:
- To train the students in the fieldwork so as to have firsthand knowledge of practical problems related to Construction Management in carrying out engineering tasks.

SYLLABUS: The students individually undertake training in reputed engineering companies doing construction during the summer vacation for a specified duration of four weeks. At the end of the training, a detailed report on the work done should be submitted within ten days from the commencement of the semester. The students will be evaluated through a viva-voce examination by a team of internal staff.

OUTCOME:
- On completion of the course, the student is expected to be able to

CO1 Describe the Construction Industry
CO2 Realize the various functions of construction activities
CO3 Develop skills in facing and solving the problems experiencing in the Construction Management field
CO4 Report Preparation
CO5 Presentation of work carried out in Practical Training

CO – PO Mapping - PRACTICAL TRAINING

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OBJECTIVES:
- To identify a specific problem for the current need of the society and collecting information related to the same through detailed review of literature.
- To develop the methodology to solve the identified problem.
- To train the students in preparing project reports and to face reviews and viva-voce examination.

SYLLABUS:
The student individually works on a specific topic approved by faculty member who is familiar in this area of interest. The student can select any topic which is relevant to his/her specialization of the programme. The topic may be experimental or analytical or case studies. At the end of the semester, a detailed report on the work done should be submitted which contains clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work. The students will be evaluated through a viva-voce examination by a panel of examiners including one external examiner.

TOTAL: 180 PERIODS

OUTCOME:
- On completion of the course, the student will be able to

CO1 Apply the knowledge gained from theoretical and practical courses in solving problems.
CO2 Summarize the importance of literature review.
CO3 Identify the problem
CO4 solve the problem based on the formulated methodology
CO5 Interpret and present the findings of the work conducted.

CO – PO Mapping - PROJECT WORK I

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TOTAL: 360 PERIODS
OUTCOME:
- On completion of the course, the student will be able to
  CO1 Discover the potential research areas.
  CO2 Apply the knowledge gained from theoretical and practical courses to be creative, well planned, organized and coordinated.
  CO3 Identify the problem.
  CO4 solve the identified problem based on the formulated methodology
  CO5 Interpret and present the findings of the work conducted

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CN4071 ADVANCED CONCRETE TECHNOLOGY L T P C
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OBJECTIVE:
- To study the properties of concrete making materials, tests, mix design, special concretes, and various methods for making concrete.

UNIT I CONCRETE MAKING MATERIALS 9

UNIT II MIX DESIGN 9
Principles of concrete mix design, Methods of concrete mix design, IS Method, ACI Method, DOE Method – Mix design for special concretes- changes in Mix design for special materials.

UNIT III CONCRETING METHODS 9
Process of manufacturing of concrete, methods of transportation, placing and curing, cracking, plastic shrinkage, Extreme weather concreting, special concreting methods. Vacuum dewatering – Underwater Concrete

UNIT IV SPECIAL CONCRETES 9

UNIT V TESTS ON CONCRETE 9

TOTAL: 45 PERIODS
OUTCOMES:
- On completion of the course, the student is expected to be able to
  CO1  Develop knowledge on various materials needed for concrete manufacture
  CO2  Apply the rules to do mix designs for concrete by various methods
  CO3  Develop the methods of manufacturing of concrete.
  CO4  Explain about various special concrete
  CO5  Explain various tests on fresh and hardened concrete

REFERENCES:
2. Shetty M.S., Concrete Technology, S.Chand and Company Ltd. Delhi, 2019.

CO-PO MAPPING

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CN4001  HUMAN RESOURCES MANAGEMENT IN CONSTRUCTION  L  T  P  C
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OBJECTIVE:
- To understand the various aspects of manpower management and to help the student
  further develop their management, team building and leadership skills so as to increase
  their effectiveness in their job performance on international projects.

UNIT I  MANPOWER PLANNING
Manpower planning and forecasting – Recruitment, selection process- Sources- Induction-
Orientation and Training - Manpower Planning process - Organising, Staffing, directing, and
controlling — Factors influencing supply and demand of human resources – Role of HR manager –
Personnel Principles.

UNIT II  ORGANISATION
Elements of an organisation- Management process in organisations- Planning- Organising- Staffing-
Directing- Controlling – Delegation of authority – responsibility – accountability – lines and staff
organisation Workforce diversity- International dimensions of Organisation- Organisational
structure- determinants of organisational design

UNIT III  HUMAN RELATIONS AND ORGANISATIONAL BEHAVIOUR
Basic individual psychology – Approaches to job design and job redesign – Self managing work
teams – Intergroup – Conflict in organizations – Leadership- Engineer as Manager –aspects of
decision making – Significance of human relation and organizational – Individual in organization –
Motivation – Personality and creativity – Group dynamics, Team working – Communication and
negotiation skills.
UNIT IV WELFARE MEASURES

UNIT V MANAGEMENT AND DEVELOPMENT METHODS

TOTAL: 45 PERIODS

OUTCOME:
• On completion of the course, the student is expected to be able to

CO1 Demonstrate practices and techniques for evaluating performance, structuring teams, coaching and mentoring people.

CO2 Explain the role of the leader and leadership principles and attitudes

CO3 Demonstrate an understanding of professional and ethical responsibilities; and

CO4 Demonstrate commitment to quality, timeliness, and continuous improvement.

CO5 Interpret their future managerial role, with emphasis on the management of the human resources and with a multi-cultural perspective

REFERENCES

CO – PO Mapping - HUMAN RESOURCES MANAGEMENT IN CONSTRUCTION

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CN4002 CONSTRUCTION PROJECT MANAGEMENT

OBJECTIVE:
• To study the various management techniques for successful completion of construction projects.

UNIT I FUNDAMENTALS OF CONSTRUCTION PROJECT MANAGEMENT
UNIT II PLANNING AND ORGANIZING CONSTRUCTION PROJECT

Construction Project organization – Planning Project work Scope and integration Processes - Defining Project Activities - Scheduling Project - CPM, PERT, Precedence Network Analysis – Planning and organizing project resources such as manpower, material, equipment, Time and cost for construction site.

UNIT III DESIGN AND CONSTRUCTION PROCESS


UNIT IV PROJECT RESOURCES UTILIZATION


UNIT V RISK MANAGEMENT AND PROJECT CONTROLLING

Risks management at construction site - Controlling resource productivity – Schedule and Cost Controlling system – Earned value management system – Project Management Information systems.

OUTCOME:

- On completion of the course, the student is expected to be able to
  
  CO1 Explain the stages involved in a project and analyze the obligatory services to be taken up while performing a construction activity.
  
  CO2 Apply the scheduling techniques for planning construction project.
  
  CO3 Develop the ability to integrate design and construction Process
  
  CO4 Analyzing Resources utilization and resource productivity.
  
  CO5 Assess the risk and controlling systems using project management Information system.

REFERENCES:


CO – PO Mapping - CONSTRUCTION PROJECT MANAGEMENT

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OBJECTIVE:
- To impart knowledge about sustainable construction and to understand the concepts of sustainable materials, energy calculations, green buildings and environmental effects.

UNIT I INTRODUCTION
Introduction and definition of Sustainability - Carbon cycle - role of construction material: concrete and steel, etc. - CO₂ contribution from cement and other construction materials.

UNIT II MATERIALS USED IN SUSTAINABLE CONSTRUCTION
Construction materials and indoor air quality - No/Low cement concrete - Recycled and manufactured aggregate - Role of QC and durability - Life cycle and sustainability.

UNIT III ENERGY CALCULATIONS
Components of embodied energy - calculation of embodied energy for construction materials - Energy concept and primary energy - Embodied energy via-a-vis operational energy in conditioned building - Life Cycle energy use

UNIT IV GREEN BUILDINGS
Control of energy use in building - ECBC code, codes in neighboring tropical countries - OTTV concepts and calculations – Features of LEED and TERI – Griha ratings - Role of insulation and thermal properties of construction materials - influence of moisture content and modeling - Performance ratings of green buildings - Zero energy building

UNIT V ENVIRONMENTAL EFFECTS
Non-renewable sources of energy and Environmental aspects – energy norm, coal, oil, natural gas - Nuclear energy - Global temperature, Green house effects, global warming - Acid rain: Causes, effects and control methods - Regional impacts of temperature change.

OUTCOME:
- On completion of the course, the student is expected to be able to

  CO1 Summarize the various sustainable materials used in construction.
  CO2 Explain the method of estimating the amount of energy required for building.
  CO3 Interpret the features of LEED, TERI and GRIHA ratings of buildings.
  CO4 Relate the concept and performance of zero energy buildings.
  CO5 Select less carbon emission materials for construction.

REFERENCES:
5. New Building Materials and Construction World magazine

CO – PO Mapping - SUSTAINABLE CONSTRUCTION

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OBJECTIVE:

- To introduce the various aspects of Construction economics and finance with the systematic evaluation of cost and benefit associated with different projects.

UNIT I 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 II 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 III EVALUATING ALTERNATIVE INVESTMENTS

- Real Estate - Investment Property, Equipment Replace Analysis, Depreciation – Tax before and after depreciation – GST– Input Tax Credit (ITC) – Assessment and Administration of GST – Inflation.

UNIT IV FUNDS MANAGEMENT


UNIT V FUNDAMENTALS OF MANAGEMENT ACCOUNTING


TOTAL : 45 PERIODS

OUTCOME:

- On completion of the course, the student is expected to be able to

  CO1 Summarize  the basic principles of Economic in construction
  CO2 Evaluate alternate proposals
  CO3 Evaluate alternative investments
  CO4 Select best source of finance for a project
  CO5 Elaborate  the finance and accounting

REFERENCES:

OBJECTIVE:
- To understand the concept of energy consumption in buildings and design an energy efficient building.

UNIT I  INTRODUCTION  9

UNIT II  PASSIVE SOLAR HEATING AND COOLING  9

UNIT III  DAYLIGHTING AND ELECTRICAL LIGHTING  9

UNIT IV  HEAT CONTROL AND VENTILATION  9

UNIT IV  DESIGN FOR CLIMATIC ZONES  9

TOTAL: 45 PERIODS
OUTCOME:
On completion of this course, the student is expected to be able to

CO1  Explain environmental energy supplies on buildings
CO2  Explain the passive solar heating, cooling system
CO3  Discuss the various aspects of day-lighting and electrical lighting in a building
CO4  Predict and design building ventilation and heat control for indoor comfort
CO5  Design a building for climatic zone and apply simulation programs of buildings to perform energy calculations

REFERENCES

CO – PO Mapping - DESIGN OF ENERGY EFFICIENT BUILDINGS

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CN4005  PROJECT SAFETY MANAGEMENT  L T P C

OBJECTIVES:
- To study and understand the various safety concepts and requirements applied to construction projects.

UNIT I  CONSTRUCTION ACCIDENTS  9

UNIT II  SAFETY PROGRAMMES  9

UNIT III  CONTRACTUAL OBLIGATIONS  9

UNIT IV  DESIGNING FOR SAFETY  9
UNIT V OWNERS’ AND DESIGNERS’ OUTLOOK


TOTAL: 45 PERIODS

OUTCOME:
- On completion of the course, the student is expected to be able to
  
CO1 Develop knowledge on accidents and their causes.
CO2 Develop knowledge about safety programs and job-site safety assessments.
CO3 Apply the knowledge of contractual obligations.
CO4 Explain about designing for safety and safety procedures.
CO5 Develop the knowledge of owners’ and designers’ responsibilities.

REFERENCES:

CO – PO Mapping - PROJECT SAFETY MANAGEMENT

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CN4006 COMPUTER APPLICATIONS IN CONSTRUCTION ENGINEERING AND PLANNING

OBJECTIVE:
- To study and understand the optimization techniques, inventory models and scheduling techniques applied to construction engineering.

UNIT I INTRODUCTION

UNIT II OPTIMIZATION TECHNIQUES
Linear, Dynamic, and Integer Programming - Branch and Bound Techniques – Application to Production Scheduling, Equipment Replacement, Material Transportation and Work Assignment Problems – Software applications.
OUTCOME:

- On completion of this course, the student is expected to be able to

  **CO1**  Use of software's in construction Industry.
  **CO2**  Apply various optimization techniques.
  **CO3**  Apply Deterministic and Probabilistic Inventory Models.
  **CO4**  Analyze the scheduling concepts.
  **CO5**  Solve problems using simulation and ERP systems.

REFERENCES:


CO – PO Mapping - COMPUTER APPLICATIONS IN CONSTRUCTION ENGINEERING AND PLANNING

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CN4007 QUANTITATIVE TECHNIQUES IN MANAGEMENT  L T P C

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OBJECTIVE:

- To study the various quantitative methods applied to the elements of management, the effect of production management, finance management, decision theory, and managerial economics.

UNIT I OPERATIONS RESEARCH

Introduction to Operations Research - Linear Programming – Graphical and Simplex Methods, Duality and Post–Optimality Analysis – Transportation and Assignment Problems.
UNIT II PRODUCTION MANAGEMENT

UNIT III FINANCIAL MANAGEMENT

UNIT IV DECISION THEORY

UNIT V MANAGERIAL ECONOMICS

TOTAL: 45 PERIODS

OUTCOME:
• On completion of the course, the student is expected to be able to

CO1 Apply the knowledge of science and engineering fundamentals in learning the concept of operations research and its practical applicability for solving challenges in construction.
CO2 Identify, formulate, plan and schedule construction engineering projects.
CO3 Apply the knowledge of financial management and cost concepts.
CO4 Design the required man, material, equipment, cost and time as per needs by proper decision rules.
CO5 Analyze the cost by break-even analysis and modern construction management software.

REFERENCES:

CO – PO Mapping - QUANTITATIVE TECHNIQUES IN MANAGEMENT

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CN4008 RESOURCE MANAGEMENT AND CONTROL IN CONSTRUCTION

OBJECTIVE:
• To impart the concepts of resource planning
• To impart the concepts of labor management.
• To impart the concepts of material and equipment.
• To impart the concepts of time management.
• To impart the concepts of resource allocation and resource leveling in construction.
UNIT I RESOURCE PLANNING
Resource Planning, Procurement, Identification, Personnel, Planning for material, Labour, time schedule and cost control, Types of resources, manpower, Equipment, Material, Money, Time.

UNIT II LABOUR MANAGEMENT
Systems approach, Characteristics of resources, Utilization, measurement of actual resources required, Tools for measurement of resources, Labour, Classes of Labour, Cost of Labour, Labour schedule, optimum use Labour.

UNIT III MATERIALS AND EQUIPMENT
Material: Time of purchase, the quantity of material, sources, Transportation, Delivery, and Distribution Equipment: Planning and selecting by optimistic choice with respect to cost, Time, Source, and handling.

UNIT IV TIME MANAGEMENT
Personnel time, Management and planning, managing time on the project, forecasting the future, Critical path measuring the changes and their effects – Cash flow and cost control.

UNIT V RESOURCE ALLOCATION AND LEVELLING

TOTAL : 45 PERIODS

OUTCOME:
- On completion of this course, the student is expected to be able to
  CO1 Identify the different types of resources in a construction industry
  CO2 Evaluate the labour productivity and the influencing factors
  CO3 Calculate the equipment output and the operation condition of construction equipment
  CO4 Describe the terms of cash inflow, cash outflow, and balance sheet
  CO5 Categorize the time and cost-related information in a construction sector.

REFERENCES:

CO – PO Mapping - RESOURCE MANAGEMENT AND CONTROL IN CONSTRUCTION

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CN4009 SHORING, SCAFFOLDING AND FORMWORK

OBJECTIVE:
- To disseminate knowledge about detailed planning.
- To impart knowledge about materials used in formwork.
- To learn design of formwork and shores.
- To disseminate knowledge about erection of form work.
- To impart knowledge about design of formwork for domes, shells, and tunnels.
UNIT I  PLANNING, SITE EQUIPMENT & PLANT FOR FORM WORK
Introduction - Forms for foundations, columns, beams, walls etc., General objectives of formwork building - Planning for safety - Development of a Basic System - Key Areas of cost reduction - Planning examples. Overall Planning - Detailed planning - Standard units - Corner units - Pass units - Calculation of labour constants - Formwork hours - Labour Requirement - Overall programme - Detailed programme - Costing - Planning crane arrangements - Site layout plan - Transporting plant - Formwork beams - Scaffold frames - Framed panel formwork - Formwork accessories.

UNIT II  MATERIALS ACCESSORIES PROPRIETARY PRODUCTS & PRESSURES

UNIT III  DESIGN OF FORMS AND SHORES
Basic simplification - Beam formulae - Allowable stresses - Deflection, Bending - Lateral stability - Shear, Bearing - Design of Wall forms - Slab forms - Beam forms - Column forms - Examples in each. Simple wood stresses - Slenderness ratio - Allowable load vs length behaviour of wood shores - Form lining Design Tables for Wall formwork - Slab Formwork - Column Formwork - Slab props - Stacking Towers - Free standing and restrained - Rosett Shoring - Shoring Tower - Heavy Duty props.

UNIT IV  BUILDING AND ERECTING THE FORM WORK
Carpentry Shop and job mill - Forms for Footings - Wall footings - Column footings - Sloped footing forms - Strap footing - Stepped footing - Slab form systems - Sky deck and Multiflex - Customized slab table - Standard Table module forms - Swivel head and uniportal head - Assembly sequence - Cycling with lifting fork - Moving with table trolley and table prop. Various causes of failures - ACI - Design deficiencies - Permitted and gradual irregularities.

UNIT V  FORMS FOR DOMES AND TUNNELS, SLIP FORMS AND SCAFFOLDS
Hemispherical, Parabolic, Translational shells - Typical barrel vaults Folded plate roof details - Forms for Thin Shell roof slabs design considerations - Building the forms - Placing concrete - Form removed - Strength requirements - Tunnel forming components - Curb forms invert forms - Arch forms - Concrete placement methods - Cut and cover construction - Bulk head method - Pressures on tunnels - Continuous Advancing Slope method - Form construction - Shafts. Slip Forms - Principles - Types - advantages - Functions of various components - Planning - Desirable characteristics of concrete - Common problems faced - Safety in slip forms special structures built with slip form Technique - Types of scaffolds - Putlog and independent scaffold - Single pole scaffolds - Truss suspended - Gantry and system scaffolds.

TOTAL: 45 PERIODS

OUTCOME:
On completion of this course, the student is expected to be able to
CO1 Explain detailed planning of formwork, plant, and site equipment.
CO2 Select material accessories for formwork connection and analyze pressures on formworks.
CO3 Design the forms and shores.
CO4 Apply the knowledge of erecting forms for beams, slabs, columns, walls, and causes of failures.
CO5 Apply the knowledge of forms and their erection for domes and tunnels, types of slip forms, and scaffolds.

REFERENCES:
2. Hurd, M.K., Formwork for Concrete, Seventh Edition, American Concrete Institute, Detroit, 2016
5. Kumar Neeraj Jha, Formwork for Concrete Structures, 2017

**CO – PO Mapping - SHORING, SCAFFOLDING AND FORMWORK**

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**CN4010 SYSTEM INTEGRATION IN CONSTRUCTION**

**OBJECTIVE:**
- To understand how the various systems that constitute a building design which are interwoven and integrated with a view to achieving a high-performance building;
- To understand about the various environmental factors.
- To understand about the various services.
- To understand about the various maintenance.
- To understand various concepts in safety planning.

**UNIT I STRUCTURAL INTEGRATION**

**UNIT II ENVIRONMENTAL FACTORS**

**UNIT III SERVICES**

**UNIT IV MAINTENANCE**
Component longevity in terms of operation performance and resistance to deleterious forces - Planning systems for least maintenance materials and construction – access for maintenance – Feasibility for replacement of damaged components – equal life elemental design – maintenance free exposed and finished surfaces.

**UNIT V SAFETY PLANNING**
Ability of systems to protect fire – Preventive systems – fire escape system design – Planning for pollution free construction environmental – Hazard free Construction execution for High Rise Buildings.

**TOTAL: 45 PERIODS**

**OUTCOME:**
- On completion of the course, the student is expected to be able to
  - CO1 Integrate the various construction techniques and incorporate into the building process
  - CO2 Appreciate the requirements and elements of HVAC, mechanical, electrical, hydraulic and transportation services in buildings
  - CO3 Design and integrate services into high-rise buildings
CO4 Interpret the intricacies of physical installation of services and their critical sequence in the construction process.

CO5 Adopt an approach relating systems to aim for a high performance building in various categories of major use

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CN4011 ADVANCED DATA ANALYSIS L T P C 3 0 0 3

OBJECTIVE:
- To learn concepts of data for construction management.
- To learn concepts of various data analysis.
- To learn concepts of regression and factor analysis.
- To learn concepts of discriminant and cluster analysis.
- To learn concepts of advanced multivariate data analysis techniques

UNIT I STATISTICAL DATA ANALYSIS 9

UNIT II BASIC CONCEPTS 9
Introduction – Basic concepts – Uni-variate, Bi-variate and Multi-variate techniques – Types of multivariate techniques – Classification of multivariate techniques – Guidelines for multivariate analysis and interpretation – Approaches to multivariate model building.

UNIT III REGRESSION AND FACTOR ANALYSIS 9
UNIT IV DISCRIMINANT AND CLUSTER ANALYSIS


UNIT V ADVANCED TECHNIQUES


TOTAL: 45 PERIODS

OUTCOME:
- On completion of the course, the student is expected to be able to
  CO1 Describe the different statistical analysis techniques.
  CO2 Students will be able to formulate hypothesis
  CO3 Explore the basic concepts of statistical analysis
  CO4 Develop regression and factor analysis model and its interpretation
  CO5 Create discriminant and cluster analysis model and its interpretation

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CO – PO Mapping - ADVANCED DATA ANALYSIS

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CN4012 ENVIRONMENTAL IMPACT ASSESSMENT FOR CONSTRUCTION ENGINEERS

OBJECTIVE:
- To impart the knowledge and skills required for understanding the various impacts of infrastructure projects on the environment.
- To impart knowledge about prediction and assessment of EIA.
- To impart the knowledge of health and socio-economic impact assessment.
- To impart the knowledge and expose the students to the various methodologies available to assess.
- To impart the knowledge to develop the skill to prepare Environmental Impact Assessment report
UNIT I  INTRODUCTION
Sustainable Development challenges and needs - Key approaches for Impact Assessment – EIA approach: historical development - Legal and Regulatory aspects in India - Types and Objectives, Components, Process of EIA.

UNIT II  PREDICTION AND ASSESSMENT

UNIT III  HEALTH AND SOCIO-ECONOMIC IMPACT ASSESSMENT

UNIT IV  INTEGRATED ANALYSIS

UNIT V  IMPACT OF INFRASTRUCTURE AND ENVIRONMENTAL SERVICES
Case Studies: EIA for Mining, extraction of natural resources and power generation - Primary Processing and Material Production - Material Processing, Manufacturing/Fabrication - Service Sectors - Physical Infrastructure including Environmental Services - Building and Construction Projects - Area Development Projects and Townships - Strategic Environmental Assessment, Technological Assessment, and Risk Assessment.

OUTCOME:
- On completion of the course, the student is expected to be able to
  CO1 Apply the knowledge of science and engineering fundamentals to sustainable development challenges.
  CO2 explain the identification, prediction, and evaluation of impacts that will be caused by projects or industries on biodiversity.
  CO3 Identify the legal requirements of environmental impact assessment for projects.
  CO4 develop the ability to perform integrated analysis by considering environmental, social, and health impacts.
  CO5 select appropriate methods for environmental impact assessment for Infrastructure and environmental service.

REFERENCES
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CN4091 LEAN CONSTRUCTION CONCEPTS, TOOLS, AND PRACTICES

OBJECTIVE:
- To impart knowledge about the basics of lean construction.
- To impart knowledge about the lean principles.
- To impart knowledge about the core concepts of lean construction.
- To impart knowledge about the lean tools and techniques.
- To impart knowledge about the basics of lean implementation in the construction industry.

UNIT I INTRODUCTION

UNIT II LEAN MANAGEMENT
Introduction to lean management – Toyota's management principle-Evolution of lean in the construction industry - Production theories in construction –Lean construction value - Value in construction - Target value design – Lean project delivery system- Forms of waste in the construction industry – Waste Elimination.

UNIT III CORE CONCEPTS IN LEAN

UNIT IV LEAN CONSTRUCTION TOOLS AND TECHNIQUES

UNIT V LEAN CONSTRUCTION IMPLEMENTATION
Lean construction implementation- Enabling lean through information technology – Lean in design - Design Structure Matrix Location Based Management System-BIM (Building Information Modelling) - IPD (Integrated Project Delivery) – Sustainability through lean construction approach

TOTAL : 45 PERIODS
OUTCOME:
On completion of this course, the student is expected to be able to

CO1 Explains the contemporary management techniques and the issues in the present scenario.

CO2 Apply the basics of lean management principles and their evolution from the manufacturing industry to the construction industry.

CO3 Develops a better understanding of core concepts of lean construction tools and techniques and their importance in achieving better productivity.

CO4 Apply lean techniques to achieve sustainability in construction projects.

CO5 Apply lean construction techniques in design and modeling

REFERENCES:

CO – PO Mapping - LEAN CONSTRUCTION CONCEPTS, TOOLS & PRACTICES

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ST4073 MAINTENANCE, REPAIR AND REHABILITATION OF STRUCTURES L T P C

OBJECTIVE:
- To study the damages, repair and rehabilitation of structures

UNIT I MAINTENANCE AND REPAIR STRATEGIES
Maintenance, Repair and Rehabilitation, retrofit and strengthening, need for rehabilitation of structures- Service life behaviour - importance of Maintenance, causes and effects of deterioration. Non-destructive Testing Techniques

UNIT II STRENGTH AND DURABILITY OF CONCRETE
Quality assurance for concrete based on Strength, Durability and Microstructure of concrete - NDT techniques- Cracks- different types, causes – Effects due to Environment, Fire, Earthquake, Corrosion of steel in concrete, Mechanism, quantification of corrosion damage

UNIT III REPAIR MATERIALS AND SPECIAL CONCRETES
Repair materials-Various repair materials, Criteria for material selection, Methodology of selection, Special mortars and concretes- Polymer Concrete and Grouting materials- Bonding agents-Latex emulsions, Epoxy bonding agents, Protective coatings-Protective coatings for Concrete and Steel, FRP sheets
UNIT IV PROTECTION METHODS AND STRUCTURAL HEALTH MONITORING
Concrete protection methods – reinforcement protection methods - cathodic protection - Sacrificial anode - Corrosion protection techniques – Corrosion inhibitors, concrete coatings-Corrosion resistant steels, Coatings to reinforcement, Structural health monitoring.

UNIT V REPAIR, RETROFITTING AND DEMOLITION OF STRUCTURES
Various methods of crack repair, Grouting, Routing and sealing, Stitching, Dry packing, Autogenous healing, Repair to active cracks, Repair to dormant cracks. Repair of various corrosion damaged of structural elements (slab, beam and columns) Jacketing Techniques, Strengthening Methods for Structural Elements. Engineered Demolition -Case studies

REFERENCES:
5. Hand Book on “Repair and Rehabilitation of RCC Buildings” – Director General works CPWD ,Govt of India , New Delhi – 2002
6. BS EN 1504 - Products and systems for the protection and repair of concrete structures - Definitions, requirements, quality control and evaluation of conformity

OUTCOMES:
- On completion of the course, the student is expected to be able to

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CO-PO-PSO MAPPING

CN4013 QUALITY CONTROL AND ASSURANCE IN CONSTRUCTION

OBJECTIVE:
- To study the concepts of quality management in construction.
- To study the concepts of quality systems.
- To study the concepts of quality planning.
- To study the concepts of quality assurance and control techniques in construction.
- To study the concepts of quality improvement techniques.
UNIT I QUALITY MANAGEMENT

UNIT II QUALITY SYSTEMS

UNIT III QUALITY PLANNING

UNIT IV QUALITY ASSURANCE AND CONTROL
Objectives – Regularity agent, owner, design, contract, and construction-oriented objectives, methods – Techniques and needs of QA/QC – Different aspects of quality – Appraisals – Sampling techniques – Sampling plan – Sampling Terms – AQL, LTPD, AOL - Factors influencing construction quality – Critical, major failure aspects and failure mode analysis, – Stability methods and tools, optimum design – Reliability testing, reliability coefficient and reliability prediction – Failure rate – Mean time to failure – Mean time to repair – Mean time between failures.

UNIT V QUALITY IMPROVEMENT TECHNIQUES
Selection of new materials – Influence of drawings, detailing, specification, standardization – Bid preparation – Construction activity, environmental safety, social and environmental factors – Natural causes and speed of construction – Life cycle costing – Value engineering and value analysis.

TOTAL: 45 PERIODS

OUTCOME:

• On completion of the course, the student is expected to be able to
  CO1 Achieve the knowledge of quality management guidelines, and quality circles.
  CO2 Apply the quality standards for preparing Quality system documents.
  CO3 Explain the skill of preparing inspection procedures for quality planning.
  CO4 Select the techniques and tools for Quality Assurance and Control in Construction Industry.
  CO5 Achieve the knowledge of quality improvement techniques

REFERENCES:

CO – PO Mapping - QUALITY CONTROL AND ASSURANCE IN CONSTRUCTION

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OBJECTIVE:
- To learn basic concepts of BIM for construction.
- To learn and acquire knowledge in the BIM-based construction design process.
- To understand the challenges in BIM implementation
- To learn and acquire knowledge in BIM-based construction automation technologies.
- To learn and acquire knowledge in Modern Digital Technologies in Construction

UNIT I INTRODUCTION TO BIM FOR CONSTRUCTION
Fundamentals of BIM – terminology, CAD & BIM. IFCs, schemas, interoperability, parametric modeling.

UNIT II DEVELOPMENT OF DESIGN PROCESS
BIM-based design process and analysis - design coordination. BIM-based construction process – 4D, 5D, nD BIM.

UNIT III CHALLENGES IN BIM IMPLEMENTATION
BIM-based operation issues – facility management. Drivers and barriers in BIM adoption, BIM global practices.

UNIT IV CONSTRUCTION AUTOMATION
Automation in design and construction, virtual experiments – augmented reality, virtual reality, use of sensors in construction.

UNIT V MODERN DIGITAL TECHNOLOGIES IN CONSTRUCTION
Robots in construction, autonomous robots, and 3D printing technology in construction. Drones for Construction monitoring, Internet of Things, Smart Manufacturing, etc.

TOTAL: 45 PERIODS

OUTCOME:
- On completion of the course, the student is expected to be able to
  CO1 To create a BIM model
  CO2 To develop the construction design process using BIM
  CO3 To identify the challenges in BIM implementation
  CO4 To use automation techniques in construction
  CO5 To implement modern digital technologies in construction

REFERENCES:

CO – PO Mapping - DIGITAL DESIGN AND CONSTRUCTION

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OBJECTIVE:
- To learn basic concepts of organizational behavior.
- To gain a solid understanding of human behavior in the workplace from an individual.
- To gain a solid understanding of human behavior in the workplace in the group.
- To learn the concepts of Leadership and power.
- To learn the dynamics of organizational behavior.

UNIT I INTRODUCTION TO ORGANIZATIONAL BEHAVIOUR

UNIT II INDIVIDUAL BEHAVIOUR

UNIT III GROUP BEHAVIOUR

UNIT IV LEADERSHIP AND POWER

UNIT V DYNAMICS OF ORGANIZATIONAL BEHAVIOUR

OUTCOME:
- On completion of the course, the student is expected to be able to
  CO1 Identify the need and importance of organizational behavior and the framework of organizational models
  CO2 Explain the various learning theories and develop alternative organizational behavior approaches in the workplace
  CO3 Describe the importance of group dynamics and team building.
  CO4 Explore the various leadership styles and politics.
  CO5 Explain the dynamics of organizational behaviour with the balance of work life.

REFERENCES:
OBJECTIVE:

- To gain knowledge about construction supply chain management.
- To understand the concepts of strategic perspectives.
- To understand the concepts of integrated data management.
- To understand the concepts of construction logistics and sustainability.
- To understand the concepts of logistics operations.

UNIT I  INTRODUCTION

UNIT II  STRATEGIC PERSPECTIVES

UNIT III  INTEGRATED DATA MANAGEMENT
Impact of BIM and new data management capabilities on supply chain management in construction – Data management for integrated supply chains in construction

UNIT IV  CONSTRUCTION LOGISTICS AND SUSTAINABILITY
Role of logistics in achieving sustainable construction – Resource efficiency benefits of effective logistics

UNIT V  LOGISTICS OPERATIONS
Role of the construction logistics manager – Third-party logistics operators in construction – Managing construction logistics for confined sites in urban areas - Consolidation centers in construction logistics – Delivery management systems.

TOTAL: 45 PERIODS

OUTCOME:

- On completion of this course, the student is expected to be able to
  CO1 Describe the conceptual and theoretical backgrounds of Supply Chain Management and logistics
  CO2 Apply the strategy in logistics functions ranging from planning to execution and control.
  CO3 Identify the Impact of BIM and new data management capabilities on supply chain management in construction.
  CO4 Analyze the implications of various strategic choices and decide on a better course of action.
  CO5 Understand the role of construction logistic Managers and Delivery management systems.
REFERENCES:
4. G Srinivasan, Quantitative Models in Operations and Supply Chain Management, PHI Learning (P) Ltd, New Delhi, 2010
5. David J. Bloomberg, Stephen Lemay and Joe B. Hanna, Logistics, PHI 2010

CO – PO Mapping - SUPPLY CHAIN MANAGEMENT AND LOGISTICS IN CONSTRUCTION

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AUDIT COURSES

AX4091 ENGLISH FOR RESEARCH PAPER WRITING L T P C 2 0 0 0

OBJECTIVES
- Teach how to improve writing skills and level of readability
- Tell about what to write in each section
- Summarize the skills needed when writing a Title
- Infer the skills needed when writing the Conclusion
- Ensure the quality of paper at very first-time submission

UNIT I INTRODUCTION TO RESEARCH PAPER WRITING 6
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT II PRESENTATION SKILLS 6

UNIT III TITLE WRITING SKILLS 6
Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check

UNIT IV RESULT WRITING SKILLS 6
Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

UNIT V VERIFICATION SKILLS 6
Useful phrases, checking Plagiarism, how to ensure paper is as good as it could possibly be the first-time submission

TOTAL: 30 PERIODS

OUTCOMES
CO1 – Understand that how to improve your writing skills and level of readability
CO2 – Learn about what to write in each section
CO3 – Understand the skills needed when writing a Title
CO4 – Understand the skills needed when writing the Conclusion
CO5 – Ensure the good quality of paper at very first-time submission

REFERENCES

AX4092 DISASTER MANAGEMENT L T P C 2 0 0 0

OBJECTIVES
- Summarize basics of disaster
- Explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
• Describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
• Develop the strengths and weaknesses of disaster management approaches

UNIT I INTRODUCTION
Disaster: Definition, Factors and Significance; Difference between Hazard And Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT II REPERCUSSIONS OF DISASTERS AND HAZARDS

UNIT III DISASTER PRONE AREAS IN INDIA
Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides And Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference To Tsunami; Post-Disaster Diseases and Epidemics

UNIT IV DISASTER PREPAREDNESS AND MANAGEMENT
Preparedness: Monitoring Of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT V RISK ASSESSMENT
Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People’s Participation in Risk Assessment. Strategies for Survival

TOTAL : 30 PERIODS

OUTCOMES
CO1: Ability to summarize basics of disaster
CO2: Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
CO3: Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
CO4: Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
CO5: Ability to develop the strengths and weaknesses of disaster management approaches

REFERENCES
OBJECTIVES
Students will be able to:
- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional Role and entitlement to civil and economic rights as well as the emergence nation hood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

UNIT I  HISTORY OF MAKING OF THE INDIAN CONSTITUTION
History, Drafting Committee, (Composition & Working)

UNIT II  PHILOSOPHY OF THE INDIAN CONSTITUTION
Preamble, Salient Features

UNIT III  CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES

UNIT IV  ORGANS OF GOVERNANCE
Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

UNIT V  LOCAL ADMINISTRATION
District’s Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO, Municipal Corporation, 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.

UNIT VI  ELECTION COMMISSION
Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.

OUTCOMES
Students will be able to:
- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

SUGGESTED READING
- The Constitution of India, 1950 (Bare Act), Government Publication.
UNIT I
1. நற்றமிழ் இலக்கியம்
   - லாபர், வெள்ளா, பச்சை
2. அகுத்தாடு (82)
   - தினமயம் நூறிகாரம் மாற்றியம்
3. நற்றமிழ் பாடல்கள் மாற்றக்காலம்
4. புறநூறு (95,195)
   - பாடல் நீதிகை துத்தோம்பாக்

UNIT II
1. அறநநறித்
   - ஆராய்ச்சி எனக் கிளிக்காவது
     - அறநர் மூன்றிகாலம், வீரப்போனீகரம், தக்காக பகுதிக்
2. பின் ஆராய்ச்சி - தினமயம் பார்விக்
   - தவரும், திரிகுடும்பம், இருக்கவிப்பு, ஆயுர்சாரிகாலம்
     (தாயாவேற்ற குறிப்பிட்டம் தன்)

UNIT III
1. ஏற்றல காப்பியங்கள்
   - இலக்கியம் புரட்சி
     - திருப்பர்வோர், சுய குற்றுத்துறை
     - கொடுந்த பனேரக்கடை பயிற்சிப் பாகிலின்

UNIT IV
1. அருளநநறித்
   - பொர்வாய்வாக போன்று
     - பாரா புறேர்களுக்கு வேல் பொருள் கொள்ளும்
       பரிமாற்ற குறிப்பிட்டம், அமிதாம் நூற்றுக்கு முன்னிருந்து
       வேல் பொருள், அருவி பொருள்
2. முடிக்கைகள்
   - முதலக்குறிகள் புனேரக குறிப்பிட்டம்
3. சிறுகதாரம் (617, 618)
   - முப்பர் நூற்றுகள் குறிப்பிட்டம்
4. நற்றிகண் நிதியியம் நகர்ந்தொர்
5. பொர்க்காளம்
   - சிறுவன் நூற்றாண்டாக குறிப்பிட்டம்
6. அகநூறு (4) - வெள்ளா
   - நூற்றுகள் (11) - சுமார்
   - குறிப்பிட்டம் (11) - பாராஜ, புரட்சி
   - கொடுந்த பகுதிகள் 50 (27) - பாரா
     - ஆவியக்காலம் புணியம் குறிப்பிட்டம்

UNIT V
1. நற்றிகண் தொன்மை
   - குறிப்பிட்டம் பதிலளி மாற்றியம்,
1. தமிழ் விக்கிப்பீடியொ (Tamil Wikipedia) - https://ta.wikipedia.org
2. தமிழ் விக்கிப்பீடியொ (Tamil Wikipedia) - https://ta.wikipedia.org
3. தமிழ் விக்கிப்பீடியொ (Tamil Wikipedia) - https://ta.wikipedia.org
4. தமிழ் விக்கிப்பீடியொ (Tamil Wikipedia) - https://ta.wikipedia.org
5. தமிழ் விக்கிப்பீடியொ (Tamil Wikipedia) - https://ta.wikipedia.org
6. தமிழ் விக்கிப்பீடியொ (Tamil Wikipedia) - https://ta.wikipedia.org

TOTAL: 30 PERIODS