ANNA UNIVERSITY, CHENNAI
AFFILIATED INSTITUTIONS
M.E. INFRASTRUCTURE ENGINEERING AND MANAGEMENT
REGULATIONS – 2017
CHOICE BASED CREDIT SYSTEM

PROGRAMME EDUCATIONAL OBJECTIVES (PEO’S)

I. Graduates will apply management and economic theories to formulate strategies to enable organizations to achieve their goals
II. Graduates of the programme will serve as project leaders with critical-thinking and analytical decision-making capabilities.
III. Graduates will be capable of integrating their knowledge of multi-disciplines of management to analyze construction industry problems
IV. Graduates of the programme will contribute as team members adding value through innovation, customer focus, prudence, and professional responsibility, consistent with the objectives of the projects in which they are involved and the organizations they support.
V. Graduate of the programme will have competence of excellence, leadership, written ethical codes and guidelines, and the life-long learning needed for a successful professional career.

PROGRAMME OUTCOMES (PO’S)
Graduating Students of M.E. Infrastructure Engineering. & Management programme will:

1. Acquire in-depth knowledge of specific discipline or professional area in Infrastructure Engineering and Management, including wider and global perspective, with an ability to discriminate, evaluate, analyze and synthesize existing and new knowledge, and integration of the same for enhancement of knowledge.

2. Analyze complex engineering problems of infrastructure engineering and management critically; apply independent judgment for synthesizing information to make intellectual and/or creative advances for conducting research in a wider theoretical, practical and policy context.

3. Think laterally and originally, conceptualize and solve engineering problems of infrastructure engineering and management, evaluate a wide range of potential solutions for those problems and arrive at feasible, optimal solutions after considering public health and safety, cultural, societal and environmental factors in the core areas of expertise.

4. Extract information pertinent to unfamiliar problems through literature survey and experiments, apply appropriate research methodologies, techniques and tools, design, conduct experiments, analyze and interpret data, demonstrate higher order skill and view things in a broader perspective, contribute individually/in group(s) to the development of scientific/technological knowledge in one or more domains of infrastructure engineering and management.

5. Create, select, learn and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering activities with an understanding of the limitations.
6. Possess knowledge and understanding of group dynamics, recognize opportunities and contribute positively to collaborative, multidisciplinary scientific research, demonstrate a capacity for self-management and teamwork, decision-making based on open-mindedness, objectivity and rational analysis in order to achieve common goals and further the learning of themselves as well as others.

7. Demonstrate knowledge and understanding of engineering and management principles and apply the same to one's own work, as a member and leader in a team, manage projects efficiently in respective disciplines and multidisciplinary environments of infrastructure engineering and management after consideration of economical and financial factors.

8. Communicate with the engineering community, and with society at large, regarding complex engineering activities confidently and effectively, such as, being able to comprehend and write effective reports and design documentation by adhering to appropriate standards, make effective presentations, and give and receive clear instructions.

9. Recognize the need for, and have the preparation and ability to engage in life-long learning independently, with a high level of enthusiasm and commitment to improve knowledge and competence continuously.

10. Acquire professional and intellectual integrity, professional code of conduct, ethics of research and scholarship, consideration of the impact of research outcomes on professional practices and an understanding of responsibility to contribute to the community for sustainable development of society.

11. Observe and examine critically the outcomes of one’s actions and make corrective measures subsequently, and learn from mistakes without depending on external feedback.
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<td>IM5301</td>
<td>Infrastructure for SMART City Planning</td>
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### PROFESSIONAL ELECTIVES

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### EMPLOYABILITY ENHANCEMENT COURSES (EEC)

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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 co-efficients.

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:
IM5101 PROJECT MANAGEMENT FOR INFRASTRUCTURE

OBJECTIVES:

UNIT I PROJECT MANAGEMENT - AN OVERVIEW: 6+6
Introduction, Project Management process, Project Management techniques, Relationship to other management disciplines, Related endeavors, Concentric project management, Project formulation and development.

UNIT II PROJECT PLANNING AND TIME MANAGEMENT: 6+6
Purpose, Project scheduling, activity definition, activity sequencing, activity duration estimating, schedule development, schedule control, project management using CPM\PERT- Network basics, Network development, PERT analysis, advantages. Computerized network analysis- features of PM software, capabilities of PM software, multi project analysis.

UNIT III ORGANIZING FOR PROJECT MANAGEMENT: 6+6

UNIT IV RESOURCE PLANNING: 6+6
Introduction, Inputs, Tools, Outputs, Resource scheduling, Resource leveling, Resource restrained scheduling, strategies for shortening the schedule Assigning resources: Work, duration, resources, Effort driven scheduling, create a resource list, Exercise on resource planning using software, Level now command, leveling Gantt chart, assigning rate to resources, techniques of duration cost trade-off..

UNIT V COST ESTIMATION: 6+6

TOTAL: 60 PERIODS
COURSE OUTCOMES:
CO1 Explain project, project management, life cycle and project formulation
CO2 Analyze and Manage time in projects through Gantt charts, and network techniques.
CO3 Analyse and manage time in projects through CPM and PERT, update and monitor projects
CO4 Optimize resources of projects using scheduling, fast tracking and re-estimation techniques
CO5 Explain different approaches for estimating cost

REFERENCES:
3. Tim Pyron – Microsoft Project 2000 in 24 hours – Sama Teach youyself series- Techmedia Published New Delhi.

IM5102 TRAFFIC ENGINEERING AND MANAGEMENT

OBJECTIVES:
- To understand and explain the various modes of Transport viz. Surface, Air, Rail and Water.

UNIT I INTRODUCTION
Importance of Transportation -Employment in Transportation- Transportation Systems and Organization - Characteristics of Driver, the Pedestrian, the Vehicle and Road(Problems)- Geometric design of pavement - Traffic and Environment, MRTS, LRTS and Underground railways

UNIT II TRAFFIC ENGINEERING STUDIES

UNIT III AIRPORT PLANNING
UNIT IV RAILWAY ENGINEERING 9

UNIT V WATERWAYS TRANSPORT SYSTEMS 9

COURSE OUTCOME
CO 1 Explain the significance and scope of traffic engineering.
CO 2 Describe the different methods of conducting Traffic volume studies.
CO3 Mention the various driver characteristics affecting traffic behaviour on roads.
CO4 State the objectives in providing road markings and describe its effectiveness in traffic regulation.
CO5 Explain roadside hazard management with suitable illustrations.

REFERENCES:

IM5103 ADVANCED STRUCTURAL DESIGN L T P C 3 0 0 3

OBJECTIVES:
- To understand and explain the design of special RC Elements, Steel Structures, Industrial Buildings, Tall Building and special structures.

UNIT I DESIGN OF SPECIAL RC ELEMENTS 9

UNIT II DESIGN OF STEEL STRUCTURES 9
UNIT III  ANALYSIS AND DESIGN OF INDUSTRIAL BUILDINGS


UNIT IV  TALL BUILDING


UNIT V  ANALYSIS AND DESIGN OF SPECIAL STRUCTURES


TOTAL: 45 PERIODS

COURSE OUTCOME

CO1 Design various concrete structures and structural elements by limit state design and detailing for ductility as per codal requirements.
CO2 Design special structures such as Deep beams, Corbels, Deep beams, and Grid floors
CO3 Design steel structures for different load conditions.
CO4 Analyze and design different types of industrial structures
CO5 Analyze and Design Bunkers, Silos and Chimneys.

REFERENCES:

OBJECTIVES:
- To understand and explain concepts of infrastructure, private involvement in infrastructure, challenges to successful infrastructure planning and implementation, strategies for successful infrastructure project implementation, sustainable development of infrastructure

UNIT I  AN OVERVIEW OF BASIC CONCEPTS RELATED TO INFRASTRUCTURE:  9
Introduction to Infrastructure, an overview of the Power Sector in India., an Overview of the Water Supply and Sanitation Sector in India., an overview of the Road, Rail, Air and Port Transportation Sectors in India. , an overview of the Telecommunications Sector in India. , an overview of the Urban Infrastructure in India, an overview of the Rural Infrastructure in India, an Introduction to Special Economic Zones, Organizations and layers in the field of Infrastructure, The Stages of an Infrastructure Project Lifecycle., an overview of Infrastructure Project Finance.

UNIT II  PRIVATE INVOLVEMENT IN INFRASTRUCTURE:  9

UNIT III  CHALLENGES TO SUCCESSFUL INFRASTRUCTURE PLANNING AND IMPLEMENTATION:  9
Mapping and Facing the Landscape of Risks in Infrastructure Projects, Economic and Demand Risks: The Case study for Political Risks, Socio-Environmental Risks, Cultural Risks in International Infrastructure Projects, Legal and Contractual Issues in Infrastructure, Challenges in Construction and Maintenance of Infrastructure.

UNIT IV  STRATEGIES FOR SUCCESSFUL INFRASTRUCTURE PROJECT IMPLEMENTATION:  9
Risk Management Framework for Infrastructure Projects, Shaping the Planning Phase of Infrastructure Projects to mitigate risks, Designing Sustainable Contracts, Introduction to Fair Process and Negotiation, Negotiating with multiple Stakeholders on Infrastructure Projects.

UNIT V  SUSTAINABLE DEVELOPMENT OF INFRASTRUCTURE:  9

TOTAL: 45 PERIODS

COURSE OUTCOME
CO1 Explain the basic concepts related to Infrastructure Projects
CO2 Explain the role of private sector in infrastructure growth.
CO3 Describe the strategies for successful Infrastructure Project implementation.
CO4 Develop Infrastructure modeling and Life Cycle Analysis Techniques.
CO5 Explain Sustainable development of Infrastructure

REFERENCES:

IM5111 TESTING AND PROJECT MANAGEMENT LAB

OBJECTIVES
- To Conduct Laboratory tests on Concrete, RCC Beams and hands on practice in Project Management Package.

EXPERIMENTS:

Material Testing Lab
1. Cube Testing – Mix Design
2. Fabrication, casting and testing of simply supported Reinforced Concrete Beam for Strength and Deflection behaviour - Testing of Simply Supported Steel Beam for Strength and Deflection Behaviour.

Project Management Lab
3. Breaking down project components.
4. Defining custom data items.
5. Planning resources and costs.
7. Quantity and Cost Estimation
8. Hands on practice in MS Project and Primavera software packages.
9. Mini project

TOTAL: 60 PERIODS

EQUIPMENTS
1. Loading frame of 100 ton capacity with required accessories
2. Compression Testing Machine (CTM) with required accessories

SYSTEM SPECIFICATIONS
HP Desktops Computers - 18 Nos
( Intel i7 core, 4 GB RAM, 1 TB HDD and 1 GB Graphics card)

SOFTWARES
1. MS Project – 10 users (latest Version)
2. Primavera – 10 users (latest Version)
3. MS Office – Excel

REFERENCES:

REFERENCES:
OBJECTIVES:
• To understand and Explain Management of Human Resources, Labour Legislation, Quality Assurance and Control, Quality management in Construction and Total Quality Management.

UNIT I   HUMAN RESOURCES MANAGEMENT   9

UNIT II   LABOUR LEGISLATION   9
Labour laws- labour law relating to construction industry- Interstate migration- Industrial relations- Collective bargaining- Worker’s participation in management. Grievance handling- discipline-role of law enforcing agencies and judiciary – women in construction industry.

UNIT III   QUALITY ASSURANCE AND CONTROL   9

UNIT IV   QUALITY MANAGEMENT IN CONSTRUCTION   9

UNIT V   TOTAL QUALITY MANAGEMENT   9

TOTAL : 45 PERIODS

COURSE OUTCOME:
CO1 Explain the need and importance of human resource management, labour laws relating to Construction industry
CO2 Identify the need and measures to improve safety in construction industry and safety audit
CO3 Explain the need for applying ergonomics to construction industry
CO4 Enumerate the need, importance, elements of quality and significance of quality assurance in industry
CO5 Explain the principles of Total Quality Management.

REFERENCES:

IM5202 GEOGRAPHICAL INFORMATION SYSTEMS FOR INFRASTRUCTURE PLANNING

OBJECTIVES:

- To Understand and Explain maps and GIS, DBMS, GIS data model, Data input, Data Analysis, GIS output design and presentation.

UNIT I INTRODUCTION TO MAPS AND GIS

UNIT II DBMS AND GIS DATA MODEL

UNIT III GIS DATA INPUT

UNIT IV GIS DATA ANALYSIS
Introduction to spatial analysis - Raster Data Spatial Analysis: Local, Neighbourhood, Zonal Operations - Vector Operations and Analysis: Topological and Non-topological operations - Network Analysis – DEM – Surface Analysis

UNIT V GIS OUTPUT DESIGN AND PRESENTATION
Introduction - Spatial and non-spatial data presentation - Map layout – Charts, graphs and multimedia output – Elements of spatial data quality – Meta data - introduction to web GIS – Applications in civil Engineering

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

CO1 Understand the fundamentals of maps, their characteristics and GIS, its components
CO2 Appreciate various spatial data models and their advantages
CO3 Produce a error free GIS database for civil engineering applications
CO4 Apply various spatial analysis tools for deriving GIS based outcome

TOTAL: 60 PERIODS
Present the spatial information along with quality assessment for applications

**TEXT BOOKS**

**IM5203 URBAN ENVIRONMENTAL MANAGEMENT**

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**OBJECTIVES:**
- To understand and Explain Urban Environmental issues, Urban waste resources management, Urban water supply, Urban waste water management, Municipal solid waste management.

**UNIT I URBAN ENVIRONMENTAL ISSUES**
Urbanization- Population growth scenario migration-Pollution of surface water resources- rivers, tanks, channels ground water exploitation - wastewater - characteristics - pollution problems - Solid waste - air pollution — CPCB norms. Urban master plans- Planning and organizational aspects.

**UNIT II URBAN WASTE RESOURCES MANAGEMENT**
Water in urban ecosystem — urban water resources planning and organization aspects-storm water management practices-types of storage-magnitude of storage-storage capacity of urban components - percolation ponds - temple tanks- rainwater harvesting.

**UNIT III URBAN WATER SUPPLY**
Demand estimation - population forecasting - source identification - water conveyance - storage reservoirs - fixing storage capacity -Distribution network - types - analysis — computer applications - Conservation techniques -Integrated urban water planning.

**UNIT IV URBAN WASTE WATER MANAGEMENT**
Sewage generation - storm drainage estimation-industry contribution-wastewater collection system-separate and combined system - hydraulic design of sewer and storm drain — waste water treatment-disposal methods-concept of decentralization- 3R concepts.

**UNIT V MUNICIPAL SOLID WASTE MANAGEMENT**

**COURSE OUTCOMES**
- CO1 Explain planning of a city and identify various urban environmental issues
- CO2 Prepare project Plans to integrate urban water resource
- CO3 Explain water resource management using available water resources
- CO4 Develop sustainable wastewater management concepts comparing with successful models followed in developed nation
- CO5 Apply the principles of solid waste management

**TOTAL : 45 PERIODS**
REFERENCES:

IM5204 GEOTECHNICAL ENGINEERING FOR INFRASTRUCTURES

OBJECTIVES:
- To understand and Explain field and laboratory methods, Construction of shallow and deep foundations, Stabilization of soils for road constructions, Ground Improvement Techniques, Geotechnical Engineering for offshore structures.

UNIT I FIELD AND LABORATORY METHODS
Field tests for permeability, in place density, vane shear test, plate bearing test, standard penetration test, SCPT, CPT, Pressure meter test. Tri-axial shear test, Drained and Un-drained test, Consolidation test, unconfined compressive strength test, Direct Shear test. Recording and reporting of data for particular engineering use e.g. for machine foundations, earth dams etc.

UNIT II CONSTRUCTION OF SHALLOW AND DEEP FOUNDATIONS:
Excavations for Foundations in soft soils - Recommendations - Types of Raft - Construction of Raft Foundations - Foundations for Transmission line towers and poles - Construction of Diaphragm walls - Coidal provisions. Selection of appropriate type of Pile - Piling rig - Pile driving hammers - Construction aspects of bored and driven Piles

UNIT III STABILIZATION OF SOILS FOR ROAD CONSTRUCTIONS
General Consideration: Components of road pavement such as subgrade, Sub base, Base course and wearing course and their functions. Need for a stabilized soil – Design criteria – Mechanisms - factors influencing choice of stabilizers - Testing and field control – Applications of Geosynthetics in road construction - Case studies.

UNIT IV GROUND IMPROVEMENT TECHNIQUES

UNIT V GEOTECHNICAL ENGINEERING FOR OFFSHORE STRUCTURES
Origin, nature and distribution of marine soils – their engineering properties - sampling and sample disturbance - Diaphragm walls – analysis - anchors

TOTAL: 60 PERIODS
COURSE OUTCOMES:
CO1 Explain various methods of Soil Exploration and Soil Testing
CO2 Conduct Field and various laboratory tests on soil.
CO3 Explain the Design and construction of Shallow Foundations
CO4 Explain the Design and construction of Deep Foundations
CO6 Describe various Ground Improvement Techniques.

REFERENCES:

IM5211 GIS LABORATORY

OBJECTIVES:
• To Demonstrate and Acquire skills in using GIS software package.

EXERCISES:
• Data Input – Onscreen Digitization – Creation of Point, Line and Polygon layers
• Projection, Re-projection and Coordinate Transformation of Maps
• Attribute data input and Measurement of Distance, Area
• Linking External Database and Tabular Data Analysis using SQL commands
• Generating Graphs, Charts and Diagrams from Tabular data
• Data Conversion – Vector to Raster and Raster to Vector
• Map Joining, Edge Matching and Layout Design
• Map compilation and Design

TOTAL: 60 PERIODS

SYSTEM SPECIFICATIONS
HP Desktop Computers - 18 Nos
(Intel i7 core, 4 GB RAM, 1 TB HDD and 1 GB Graphics card).

SOFTWARES
i) ESRI – ArcGIS (latest Version) – 18 Users
ii) Quantum GIS (Open Source) – 18 Users

OUTCOMES:
CO1 Understand the Projection Systems and their applications
CO2 Compile and Design a typical map with suitable map elements
CO3 Generate Spatial Databases through spatial and non-spatial data input
CO4 Analyse attribute data using SQL commands
CO5 Present outcome in spatial and pictorial form

REFERENCE:
OBJECTIVES:
To study the various types of construction contracts and their legal aspects and provisions.
To study the of tenders, arbitration, legal requirement, and labour regulations.

UNIT I CONSTRUCTION CONTRACTS

UNIT II TENDERS

UNIT III ARBITRATION

UNIT IV LEGAL REQUIREMENTS

UNIT V LABOUR REGULATION

TOTAL : 45 PERIODS

OUTCOME:
• On completion of this course the students will know different types of contracts in construction, arbitration and legal aspect and its provisions.

REFERENCES:
1. Gajaria G.T., Laws Relating to Building and Engineering Contracts in India,
OBJECTIVES:

- To understand and explain Green building concepts, Smart urban transport systems, Water supply and drainage, E-Governance and IOT.

UNIT I INTRODUCTION
Understanding – Dimensions – Global experience, Global standards and performance benchmarks, Practice codes. India 100 smart cities policy and mission, Smart city planning and development, Financing smart cities development, Governance of smart cities.

UNIT II GREEN BUILDING CONCEPTS AND SUSTAINABLE DEVELOPMENT

UNIT III SMART URBAN TRANSPORT SYSTEMS

UNIT IV WATER SUPPLY AND DRAINAGE

UNIT V E- GOVERNANCE AND IOT

TOTAL: 45 PERIODS

COURSE OUTCOME
CO1 Explore and understand the fundamental concepts of smart and sustainable cities.
CO2 Explain the component of smart cities and dwell into their technological advancement.
CO3 Appreciate the involvement of stakeholders in the design and implementation of responsive smart cities.
CO4 Explain the importance of different linkages and their roles including government, urban planners, universities, city developers and communities.
CO5 Identify and recognize the role of ICT and data analytics in addressing the urban challenges.
and key issues

REFERENCES:

ST5001 MAINTENANCE AND REHABILITATION OF STRUCTURES

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

UNIT I INTRODUCTION

UNIT II BUILDING CRACKS

UNIT III MOISTURE PENETRATION

UNIT IV DISTRESSES AND REMEDIES
Masonry Structures: Discoloration and weakening of stones – Biotic treatments – Preservation – Chemical preservatives – Brick masonry structures – Distresses and remedial measures.

UNIT V STRENGTHENING OF EXISTING STRUCTURES

OUTCOME:

TOTAL: 45 PERIODS

23
At the end of this course students will be in a position to point out the causes of distress in concrete, masonry and steel structures and also they will be able to suggest the remedial measures.

REFERENCES:

IM5001 MODERN CONSTRUCTION MATERIALS AND TECHNOLOGY

OBJECTIVES:
• To Understand and Explain Special Concrete, Metals, Composite and other materials, Sub structure construction and super structure construction.

UNIT I SPECIAL CONCRETES

UNIT II METALS

UNIT III COMPOSITES AND OTHER MATERIALS
Types of Plastics – Properties & Manufacturing process – Advantages of Reinforced polymers–Types of FRP–FRP on different structural elements – Applications of FRP -Types and properties of Water Proofing Compounds – Types of Non- weathering Materials and its uses – Types of Flooring and Facade Materials and its application Types & Differences between Smart and Intelligent Materials - Special features – Case studies showing the applications of smart & Intelligent Materials.

UNIT IV SUB STRUCTURE CONSTRUCTION:
Box jacking- pipe jacking- under water construction of diaphragm walls and basement- tunneling Techniques - cable anchoring and grouting-driving diaphragm walls, sheet piles, laying operations for built up offshore system- shoring for deep cutting- large reservoir construction –trenchless technology.

UNIT V SUPERSTRUCTURE 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 – launching techniques- suspended form work -erection techniques of tall structures, Large span structures- launching techniques for heavy decks, In situ pre-stressing in high rise
structures, aerial transporting, handling, erecting lightweight components on tall structures

TOTAL: 45 PERIODS

COURSE OUTCOME:
CO1 Explain the properties and applications of special concretes, composites, smart and intelligent materials
CO2 Identify and explain advanced construction techniques used for sub structure construction
CO3 Select appropriate techniques for super structure construction of buildings
CO4 Select suitable techniques for construction of special structures
CO5 Choose relevant technique for demolition and dismantling works

REFERENCES:
1. ACI Report 440.2R-02, “Guide for the design and construction of externally bonded RP systems for strengthening concrete structures”, American Concrete Institute, 2002.

IM5002 MATERIAL PROCUREMENT AND MANAGEMENT L T P C
3 0 0 3

OBJECTIVES :
• To Understand and Explain various types of Material Procurement, Management, Stores management and Quality Control

UNIT I INTRODUCTION:
Importance of material management and its role in construction industry scope, objectives and functions, Integrated approach to materials management, Role of materials manager.

UNIT II CLASSIFICATION AND CODIFICATION OF MATERIALS OF CONSTRUCTION:

UNIT III INVENTORY MANAGEMENT
Store Purchase Manual, Contractors Obligation. Inventory Control techniques. EOQ, Advantages and limitation of use of EOQ, Periodic ordering, order point control, safety stock, stock outs, application of AC analysis in inventory control, concept of (JIT) - Just in time management, Indices used for assessment of effectiveness of inventory management.
UNIT IV      STORES MANAGEMENT:  
Receipt and inspection, care and safety in handling, loss on storage, wastage, Bulk purchasing, site layout and site organization, scheduling of men, materials and equipment.

UNIT V      QUALITY CONTROL  

TOTAL: 45 PERIODS

COURSE OUTCOME
CO1 Identify the need and role of material management Understand
CO2 Classify materials, identify sources of procurement, conduct vendor analysis
CO3 Exercise control for effective management of inventory
CO4 Manage stores and exercise quality control on materials
CO5 Apply MMS in planning, procurement, inventory and cost control, evaluate projects and manage risks

REFERENCES

ST5009                                           P  
PRESTRESSED CONCRETE                             L  T  P  C 
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OBJECTIVE:
- Principle of prestressing, analysis and design of prestressed concrete structures.

UNIT I      PRINCIPLES OF PRESTRESSING  

Basic concepts of Prestressing - Types and systems of prestressing - Need for High Strength materials, Analysis methods, losses of prestress – Short and Long term deflections – Cable layouts.

UNIT II  
**DESIGN OF FLEXURAL MEMBERS**  
9
Behaviour of flexural members, determination of ultimate flexural strength – Various Codal provisions - Design of flexural members, Design for shear, bond and torsion. Transfer of prestress – Box girders.

UNIT III  
**DESIGN OF CONTINUOUS AND CANTILEVER BEAMS**  
9
Analysis and design of continuous beams - Methods of achieving continuity - concept of linear transformations, concordant cable profile and gap cables – Analysis and design of cantilever beams.

UNIT IV  
**DESIGN OF TENSION AND COMPRESSION MEMBERS**  
9
Design of tension members - application in the design of prestressed pipes and prestressed concrete cylindrical water tanks - Design of compression members with and without flexure - its application in the design piles, flag masts and similar structures.

UNIT V  
**DESIGN OF COMPOSITE MEMBERS**  
9
Composite beams - analysis and design, ultimate strength - their applications. Partial prestressing - its advantages and applications.

**TOTAL: 45 PERIODS**

**OUTCOME:**
- On completion of this course students will have sufficient knowledge on various methods of prestressing and the concepts of partial pre-stressing.
- They will be in a position to design beams, pipes, water tanks, posts and similar structures.

**REFERENCES:**

**CN5204  ECONOMICS AND FINANCE MANAGEMENT IN CONSTRUCTION**  
**L T P C**  
3 0 0 3

**OBJECTIVES:**
- To study the concepts of Construction Economic and Finance such as comparing alternatives proposals, evaluating alternative investments, management of funds, and management of accounting.

UNIT I  
**BASIC PRINCIPLES**  
9
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**  
9
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 – Value Added Tax (VAT) – Inflation.

UNIT IV FUNDS MANAGEMENT

UNIT V FUNDAMENTALS OF MANAGEMENT ACCOUNTING

TOTAL : 45 PERIODS

OUTCOME:
- On completion of this course the students will be able to know the concepts in economics and finance in constructions.

REFERENCES:

IM5003 SUSTAINABLE DEVELOPMENT AND URBAN PLANNING

OBJECTIVES :
- To Understand and Explain Sustainable Development, Environmental sustainability, Empowerment, Urban planning and Built in Environment

UNIT I INTRODUCTION TO SUSTAINABLE DEVELOPMENT:

UNIT II ENVIRONMENTAL SUSTAINABILITY:
UNIT III EMPOWERMENT:
Empowerment of Women, Children, Youth, Indigenous People, Non-Governmental Organizations, Local Authorities, Business and Industry - Sustainability indicators — Hurdles to sustainability-Operational guidelines-Interconnected prerequisites for sustainable development - Science and Technology for sustainable development - Performance indicators of sustainability and Assessment mechanism — Constraints and barriers for sustainable development.

UNIT IV URBAN PLANNING AND ENVIRONMENT:
Environment and Resources, Sustainability Assessment, Future Scenarios, Form of Urban Region, Managing the change, Integrated Planning, Sustainable Development

UNIT V THE BUILT IN ENVIRONMENT:
Urban Form, Land Use, Compact Development, Principles of street design- complete streets, Transport Integrated Urban land use Planning, , Guidelines for Environmentally sound Transportation

TOTAL: 45 PERIODS

COURSE OUTCOMES
CO1 Describe the concept and socio-economic policies of Sustainable Development
CO2 Identify the strategies for implementing eco development programmes
CO3 Identify different approaches for resource conservation and management
CO4 Suggest action plans for implementation of sustainable development
CO5 Explain Urban Planning and Environment

REFERENCES

IM5004 ENVIRONMENTAL IMPACT ASSESSMENT FOR INFRASTRUCTURE PROJECTS
L T P C
3 0 0 3

OBJECTIVES:
• To understand and Explain Overview, Prediction and Assessment, Health Assessment, Environmental management plan and Case studies.

UNIT I OVERVIEW
Sustainable Development challenges and need- Key approaches for Impact Assessment Assessing Environmental Impacts - EIA Approach: Historical development, Legal and Regulatory aspects in India, Types and Objectives, Components, Process of EIA.
UNIT II PREDICTION AND ASSESSMENT: 9
Tools, impact on air, water, soil & Noise, Role of Biodiversity impact Assessment, Identification, Prediction & Evaluation of Impacts on Biodiversity, Techniques of Biodiversity impact assessment, EIA Report Preparation

UNIT III HEALTH ASSESSMENT 9
Impact of Environment on Health, Developing framework for Health impact analysis, tools and techniques, Case studies. Socio-Economic Impact Assessment: Overview and Scope of Social Impact Assessment, SIA model and the planning process, Land acquisition - Legal aspects, Resettlement & Rehabilitation and Development

UNIT IV ENVIRONMENTAL MANAGEMENT PLAN 9
Preparation and implementation, Mitigation and Rehabilitation plans, Post Project Audit. Integrated Analysis Of Environmental, Social And Health Impacts: Challenges for Integrated Approach, Scope for Integrated approach in economic analysis - CBA, Social CBA, and Cost effectiveness Analysis, the Analytic Hierarchy process based approach to project appraisal, Emerging Dimensions and future Directions-Strategic Environmental Assessment, Technological Assessment and Risk Assessment.

UNIT V CASE STUDIES 9
Extraction of natural resources and power generation, Primary Processing and Material production, Material Processing, Manufacturing/Fabrication, Service Sectors, Physical Infrastructure including Environmental Services, Building/Construction Projects/Area Development Projects & townships.

TOTAL : 45 PERIODS

COURSE OUTCOMES
CO1 Understand the necessity to study the impacts that will be caused by projects or industries and the methods to assess these impacts
CO2 Describe the legal requirements of environmental impact assessment for projects
CO3 Prepare terms of reference for environmental impact and socio-economic impact for any Developmental project
CO4 Prepare environmental management plan and mitigation measures by considering environmental aspects, impacts and potential hazards respectively for any project

REFERENCES
OBJECTIVES:
- To Understand and Explain Pavement Analysis, Pavement structure and its Evaluation, pavement overlays and design, Pavement management system, Pavement evaluation and rehabilitation.

UNIT I  PAVEMENT SURFACE CONDITION & ITS EVALUATION:

UNIT II  PAVEMENT STRUCTURE & ITS EVALUATION:
Factors affecting Structural Condition of Flexible and Rigid Pavements; Effects of Sub-grade Soil, Moisture, Pavement Layers, Temperature, Environment and Traffic on Structural Stability, Pavement Deterioration. Evaluation by Non-Destructive Tests such as FWD, Benkelman Beam Rebound Deflection, Plate Load Test, Wave Propagation and other methods of Load Tests; Evaluation by Destructive Test Methods, and Specimen Testing

UNIT III  PAVEMENT OVERLAYS & DESIGN:

UNIT IV  PAVEMENT MANAGEMENT SYSTEM:
Concepts of pavement management systems, pavement performance prediction – concepts, modeling techniques, structural conditional deterioration models. HDM.

UNIT V  PAVEMENT EVALUATION AND REHABILITATION:
Pavement evaluation – surface and structural - causes and types of failures in flexible and rigid pavements – Presents serviceability index of roads – Overlay design - pavements maintenance, management and construction – Drainage and its importance in pavements.

TOTAL: 45 PERIODS

COURSE OUTCOMES
CO 1  Explain the Pavement Surface Condition & its Evaluation
CO 2  Describe Pavement Structure and its Evaluation
CO 3  Design Pavement Overlays
CO 4  Explain Pavement Management System
CO 5  Explain different models and optimization methodologies

REFERENCES:

IM5006 SAFETY IN CONSTRUCTION ENGINEERING

OBJECTIVES:
- To Understand and Explain the of construction accidents, safety programmes, contractual obligations, and design for safety.

UNIT I CONSTRUCTION ACCIDENTS 9

UNIT II SAFETY PROGRAMMES 9

UNIT III CONTRACTUAL OBLIGATIONS 9
Safety in Construction Contracts – Substance Abuse – Safety Record Keeping.

UNIT IV DESIGNING FOR SAFETY 9

UNIT V OWNER’S AND DESIGNERS’ OUTLOOK 9
Owner’s responsibility for safety – Owner preparedness – Role of designer in ensuring safety – Safety clause in design document.

COURSE OUTCOME
CO1 Explain the construction accidents
CO2 Explain the safety programme.
CO3 Describe contractual obligations.
CO4 Explain the safety design.
CO5 Explain the outlook of owner and designer.

REFERENCES:
2. Richard J. Coble, Jimmie Hinze and Theo C. Haupt, Construction Safety and
3. Tamilnadu Factory Act, Department of Inspectorate of factories, Tamilnadu.
ST5301 EARTHQUAKE ANALYSIS AND DESIGN OF STRUCTURES

OBJECTIVE:

- To study the effect of earthquakes, analysis and design of earthquake resistant Structures.

UNIT I EARTHQUAKE GROUND MOTION
Engineering Seismology (Definitions, Introduction to Seismic hazard, Earthquake Phenomenon), Seismotectonics and Seismic Zoning of India, Earthquake Monitoring and Seismic Instrumentation, Characteristics of Strong Earthquake Motion, Estimation of Earthquake Parameters, Microzonation.

UNIT II EFFECTS OF EARTHQUAKE ON STRUCTURES
Dynamics of Structures SDOFS MDOFS - Response Spectra - Evaluation of Earthquake Forces as per codal provisions - Effect of Earthquake on Different Types of Structures - Lessons Learnt From Past Earthquakes

UNIT III EARTHQUAKE RESISTANT DESIGN OF MASONRY STRUCTURES

UNIT IV EARTHQUAKE RESISTANT DESIGN OF RC STRUCTURES

UNIT V VIBRATION CONTROL TECHNIQUES
Vibration Control - Tuned Mass Dampers – Principles and application, Basic Concept of Seismic Base Isolation – various Systems- Case Studies, Important structures.

TOTAL: 45 PERIODS

OUTCOME:

- At the end of this course the students will be able to understand the causes and effect of earthquake.
- They will be able to design masonry and RC structures to the earthquake forces as per the recommendations of IS codes of practice.

REFERENCES:

OBJECTIVES:

- To Understand and Explain Earthquake Disaster, FLOODS, TROPICAL CYCLONES, TSUNAMI, Nuclear Disaster and Disaster Management policy and procedure.

UNIT I INTRODUCTION

UNIT II EARTHQUAKE DISASTER
Causes of Earthquakes, Earthquake Size Seismic waves, Inertia forces, Natural period, Damping, Types of damping, Seismic response of free and damped vibration, Performance of ground and buildings in past Earthquakes, Earthquake resistant measures in RC and Masonry buildings. Land Slide: Introduction, Causes, Landslide zoning map, Protection measures

UNIT III FLOODS, TROPICAL CYCLONES, TSUNAMI
Introduction - Causes, Effects on buildings, protection measures from damage to buildings, Flood, cyclone, Tsunami zone map, Mitigation Strategies

UNIT IV NUCLEAR DISASTER
Chemical and industrial accidents, DM Guidelines for Biological disaster, chemical disaster. Hazard Assessment Procedure - Phases of disaster Management, Alternate communication systems, Vulnerability Assessment and seismic strengthening of buildings, Performance Level, RVS Method of Screening – RC and Masonry Structures, Seismic Hazard Assessment – Deterministic Seismic Hazard. Landuse Zoning Regulations & Quality Control - Community planning Community Contingency plan, Role of Local and state bodies, Recommendations For Land use Zoning Regulations For natural disaster.

UNIT V DISASTER MANAGEMENT POLICY AND PROCEDURE

COURSE OUTCOMES
CO1: Explain the various types of disaster viz. Hydrological, Coastal and Marine Disasters, Atmospheric Disasters, Geological, Mass Movement and Land Disasters, Wind and Water Driven Disasters.
CO2: To identify the potential deficiencies of existing buildings for EQ disaster and suggest suitable remedial measures.
CO3: Derive the guidelines for the precautionary measures and rehabilitation measures for EQ disaster.
CO4: Explain the effects of disasters on built structures
CO5: Derive the protection measures against floods, cyclone, land slides

REFERENCES
OBJECTIVES:

- To Understand and Explain Value Engineering, Estimation, Job Plan, Reliability estimation and Various Phases.

UNIT I INTRODUCTION
Value Engineering (VE) and Value Analysis (VA) - Life Cycle of a product-Methodology of value engineering – Difference from the conventional methods of cost reduction- Unnecessary costs reasons- Quantitative definition of value- Use value and Prestige value.

UNIT II ESTIMATION

UNIT III JOB PLAN
Functional approach to value improvement-various phases and techniques of Job Plan – Factors governing project selection – Types of Projects-Life Cycle Costing (LCC) for managing the Total Value- Concepts in LCC – Present value concept-Annuitly concept- Net Present value concept- Pay back period-Internal rate of return on Investment (IRR)-Examples and Illustrations.

UNIT IV RELIABILITY ESTIMATION
Creative thinking and creative judgment- positive or constructive discontent- Tangible and Intangible costs of implementation-False material-labour and overhead saving – Relationship between savings and probability of success- Reliability estimation-System reliability- Reliability elements in series and parallel.

UNIT V VARIOUS PHASES

TOTAL :45 PERIODS

COURSE OUTCOME
- CO1 Establish the Value engineering methodology
- CO2 Recognize the various phases of value engineering
- CO3 Perform function cost worth analysis
- CO4 Create the ideas for solving the problems
CO5 Analyze the functional importance and functional cost
CO6 Recommend the present facts and present costs

REFERENCES
2. A.D.Raven, Profit Improvement through Value Analysis, value Engineering and Purchase Price Analysis, Cassell and Co. London. (1971)

IM5009 BRIDGE ENGINEERING AND MAINTENANCE  
L T P C  3 0 0 3

OBJECTIVES :
- To Understand and Explain Short and Long span RC bridges, Pre stressed concrete bridges, Steel bridges, Bearings and Substructures and maintenance of bridges.

UNIT I SHORT SPAN & LONG SPAN RC BRIDGES  
9
Types of bridges and loading standards - Choice of type - I.R.C. specifications for road bridges - Design of RCC solid slab bridges - analysis and design of slab culverts ,Tee beam and slab bridges Continuous girder bridges ,box girder bridges, balanced cantilever bridges - Arch bridges — Box culverts .

UNIT II PRE-STRESSED CONCRETE BRIDGES  
9
Flexural and torsional parameters- Courbon's theory-Distribution co-efficient by exact analysis-Design of girder section-maximum and minimum pre-stressing forces - Eccentricity - Live load and dead load shear forces - Cable Zone in girder - check for stresses at various sections - check for diagonal tension- Diaphragms - End block - short term and long term deflections.

UNIT III STEEL BRIDGES  
9
General-Railway loadings-dynamic effect-Railway culvert with steel beams - Plate girder bridges - Box girder bridges - Truss bridges-Vertical and Horizontal stiffeners.

UNIT IV BEARINGS AND SUBSTRUCTURES  
9
Different types of bearings- Design of bearings- Design of piers and abutments of different types-Types of bridge foundations- Design of foundations.

UNIT V MAINTENANCE OF BRIDGES  
9
Technical and specialized repairs, including jacking up the structures, crack repairs, epoxy injection, repairing or adjusting bearing systems, repair and sealing of expansion joints, repair or reinforcement of main structural members to include stringers, beams, piers, pier and pile cap, abutments and footings, underwater repairs, major deck repairs, and major applications of coatings and sealants.

TOTAL :45 PERIODS

COURSE OUTCOME
CO1 Explain the types of bridges and loading standards
CO2 Explain Design Principles of Long Span RC Bridges
CO3 Describe Flexural and Torsional parameters of Pre-stressed Concrete bridges
CO4 Explain the various types of Steel Bridges
CO5 Explain different types of Bearings
REFERENCES: