

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.

Programme Educational Objectives	Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
I	✓	✓		✓							
II					✓	✓	✓				
III				✓	✓	✓	✓				
IV							✓	✓	✓		
V		✓	✓						✓	✓	✓

			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
YEAR 1	SEM 1	Statistical Methods for Engineers	✓		✓			✓					
		Project Management for Infrastructure			✓	✓	✓			✓			
		Traffic Engineering and Management	✓	✓	✓		✓						
		Advanced Structural Design	✓	✓			✓						
		Infrastructure Planning and Management			✓	✓		✓	✓				
		Professional Elective I		✓					✓	✓	✓		
	SEM 2	Management of Human Resource and Quality		✓		✓						✓	
		Geographical Information systems for Infrastructure Planning.		✓		✓						✓	
		Urban Environmental Management		✓	✓								
		Geo Technical Engineering for Infrastructures		✓	✓	✓		✓				✓	
		Professional Elective II	✓					✓				✓	
		Professional Elective III	✓		✓			✓					✓
		GIS Laboratory	✓		✓			✓					✓
YEAR 2	SEM 1	Contract Laws and Regulations			✓			✓		✓		✓	
		Infrastructure for SMART City Planning	✓			✓			✓		✓		
		Professional Elective IV	✓			✓			✓		✓		
		Industrial Training (4 weeks)				✓			✓	✓		✓	✓
		Seminar								✓			
	Project Work (Phase I)		✓		✓				✓			✓	✓
	SEM 2	Project Work (Phase II)		✓		✓			✓			✓	✓

Professional Electives (PE)

Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P11
Environmental Impact Assessment for Infrastructure Projects					✓	✓			✓		
Economics And Finance Management In Construction		✓	✓	✓					✓	✓	✓
Prestressed Concrete		✓							✓		
Material Procurement and Management	✓			✓							
Earthquake Analysis and Design of Structures	✓					✓					
Sustainable Development and Urban Planning		✓		✓	✓						
Modern Construction Material and Technology		✓		✓		✓			✓	✓	✓
Maintenance and Rehabilitation of Structures		✓		✓		✓			✓	✓	✓
Pavement Analysis Design and Evaluation			✓								
Disaster Mitigation and Management	✓					✓					
Value Engineering		✓		✓							
Bridge Engineering and Maintenance				✓		✓					✓
Safety in Construction Engineering		✓		✓		✓			✓	✓	✓

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CURRICULA AND SYLLABI

SEMESTER I

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	MA5165	Statistical Methods for Engineers	FC	4	4	0	0	4
2.	IM5101	Project Management for Infrastructure	PC	4	2	2	0	3
3.	IM5102	Traffic Engineering and Management	PC	3	3	0	0	3
4.	IM5103	Advanced Structural Design	PC	3	3	0	0	3
5.	IM5104	Infrastructure Planning and Management	PC	3	3	0	0	3
6.		Professional Elective I	PE	3	3	0	0	3
PRACTICAL								
7.	IM5111	Testing and Project Management Lab	PC	4	0	0	4	2
TOTAL				24	18	2	4	21

SEMESTER II

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	IM5201	Management of Human Resource and Quality	PC	3	3	0	0	3
2.	IM5202	Geographical Information systems for Infrastructure Planning	PC	4	2	2	0	3
3.	IM5203	Urban Environmental Management	PC	3	3	0	0	3
4.	IM5204	Geo Technical Engineering for Infrastructures	PC	4	2	0	2	3
5.		Professional Elective II	PE	3	3	0	0	3
6.		Professional Elective III	PE	3	3	0	0	3
PRACTICAL								
7.	IM5211	GIS Laboratory	PC	4	0	0	4	2
TOTAL				24	16	2	6	20

SEMESTER III

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	CN5202	Contract Laws and Regulations	PC	3	3	0	0	3
2.	IM5301	Infrastructure for SMART City Planning	PC	3	3	0	0	3
3.		Professional Elective IV	PE	3	3	0	0	3
PRACTICAL								
4.	IM5311	Seminar	EEC	2	0	0	2	1
5.	IM5312	Industrial Training (4 weeks)	EEC	-	-	-	-	2
6.	IM5313	Project Work (Phase I)	EEC	12	0	0	12	6
TOTAL				23	9	0	14	18

SEMESTER IV

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
PRACTICAL								
1.	IM5411	Project Work (Phase II)	EEC	24	0	0	24	12
TOTAL				24	0	0	24	12

TOTAL NO. OF CREDITS: 71

FOUNDATION COURSES (FC)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MA5165	Statistical Methods for Engineers	FC	4	4	0	0	4

PROFESSIONAL CORE (PC)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	IM5101	Project Management for Infrastructure	PC	4	2	2	0	3
2.	IM5102	Traffic Engineering and Management	PC	3	3	0	0	3
3.	IM5103	Advanced Structural Design	PC	3	3	0	0	3
4.	IM5104	Infrastructure Planning and Management	PC	3	3	0	0	3
5.	IM5111	Testing and Project Management Lab	PC	4	0	0	4	2
6.	IM5201	Management of Human Resource and Quality	PC	3	3	0	0	3
7.	IM5202	Geographical Information systems for Infrastructure Planning	PC	4	2	2	0	3
8.	IM5203	Urban Environmental Management	PC	3	3	0	0	3
9.	IM5204	Geo Technical Engineering for Infrastructures	PC	4	2	0	2	3
10.	IM5211	GIS Laboratory	PC	4	0	0	4	2
11.	CN5202	Contract Laws and Regulations	PC	3	3	0	0	3
12.	IM5301	Infrastructure for SMART City Planning	PC	3	3	0	0	3

PROFESSIONAL ELECTIVES

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
SEMESTER I (ELECTIVE I)								
1.	ST5001	Maintenance and Rehabilitation of Structures	PE	3	3	0	0	3
2.	IM5001	Modern Construction Material and Technology	PE	3	3	0	0	3
3.	IM5002	Material Procurement and Management	PE	3	3	0	0	3
SEMESTER II (ELECTIVE II & ELECTIVE III)								
1.	ST5009	Prestressed Concrete	PE	3	3	0	0	3
2.	CN5204	Economics and Finance Management In Construction	PE	3	3	0	0	3
3.	IM5003	Sustainable Development and Urban Planning	PE	3	3	0	0	3
4.	IM5004	Environmental Impact Assessment for Infrastructure Projects	PE	3	3	0	0	3
5.	IM5005	Pavement Analysis Design and Evaluation	PE	3	3	0	0	3
6.	IM5006	Safety in Construction Engineering	PE	3	3	0	0	3
SEMESTER III (ELECTIVE IV)								
1.	ST5301	Earthquake Analysis and Design of Structures	PE	3	3	0	0	3
2.	IM5007	Disaster Mitigation and Management	PE	3	3	0	0	3
3.	IM5008	Value Engineering	PE	3	3	0	0	3
4.	IM5009	Bridge Engineering and Maintenance	PE	3	3	0	0	3

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	IM5311	Seminar	EEC	2	0	0	2	1
2.	IM5312	Industrial Training (4 Weeks)	EEC	-	-	-	-	2
3.	IM5313	Project Work (Phase I)	EEC	12	0	0	12	6
4.	IM5411	Project Work (Phase I I)	EEC	24	0	0	24	12

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**

Estimators: Unbiasedness, Consistency, Efficiency and sufficiency – Maximum likelihood estimation – Method of moments.

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-efficient.

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 :

1. Gupta.S.C., and Kapoor, V.K., “Fundamentals of Mathematical Statistics”, Sultan Chand and Sons, 11th Edition, 2002.

2. Jay L. Devore, "Probability and statistics for Engineering and the Sciences", 8th Edition, Cengage Learning, 2014.
3. Johnson, R.A. and Wichern, D. W. "Applied Multivariate Statistical Analysis", Pearson Education, Asia, 6th Edition, 2007.
4. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
5. Rice, J.A. "Mathematical Statistics and Data Analysis", 3rd Edition, Cengage Learning, 2015.

IM5101

PROJECT MANAGEMENT FOR INFRASTRUCTURE

**L T P C
2 2 0 3**

OBJECTIVES :

- To Understand and Explain Project Management Process, Project Planning and Time Management, Organizing for Project Management, Resource Planning and Cost Estimation.

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

Project Management – modern trends - Strategic Planning - Effects of Project Risks on Organization - Organization of Project Participants -Traditional Designer-Constructor Sequence - Professional Construction Management - Owner-Builder Operation - Turnkey Operation - Leadership and Motivation for the Project Team.

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

Costs Associated with Constructed Facilities - Approaches to Cost Estimation - Type of Construction Cost Estimates - Effects of Scale on Construction Cost - Unit Cost Method of Estimation - Methods for Allocation of Joint Costs - Historical Cost Data - Cost Indices - Applications of Cost Indices to Estimating - Estimate Based on Engineer's List of Quantities - Estimation of Operating Costs.

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:

1. Harold Kerzner – Project Management – systems approach to planning, scheduling & controlling – 7th edition, John Wiley & Sons, Canada.
2. Microsoft Project for Windows 2000 –Microsoft Press, USA 2000.
3. Tim Pyron – Microsoft Project 2000 in 24 hours – Sama Teach yourself series- Techmedia Published New Delhi.
4. Chitkara, K.K. "Construction Project Management: Planning, Scheduling and Control", Tata McGraw-Hill Publishing Company, New Delhi, 1998.
5. Choudhury S , "Project Management", McGraw-Hill Publishing Company, New Delhi, 1988.
6. Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders", Prentice Hall, Pittsburgh, 2000.
7. Frederick E. Gould, "Construction Project Management", Wentworth Institute of Technology, Vary E. Joyce, Massachusetts Institute of Technology, 2000.
8. George J.Ritz , "Total Construction Project Management" - McGraw-Hill Inc, 1994.

IM5102**TRAFFIC ENGINEERING AND MANAGEMENT****L T P C
3 0 0 3****OBJECTIVES :**

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

UNIT I INTRODUCTION**9**

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**9**

Statistical studies for Traffic Engineering, Speed studies- Volume Studies -Travel time and Delay Studies -Parking Studies-Traffic Forecasting - Accident Studies (concepts and problems), Traffic Flow Theory-Macroscopic and Microscopic Traffic model- Shock Waves -Traffic Flow at signal and un- signal intersection- Simulation of Traffic (Concepts and problems). Roadside hazard management, road safety at road works, Road safety audit – stages, report writing, Methods of traffic management, Role of ITS in traffic management.

UNIT III AIRPORT PLANNING**9**

Airport – Accessibility – Transport Connections – Road and Rail, Expansion – Feasibility Studies – Environmental and Social Issues – Forecasting Future Traffic – Airfield Capacity and Delay - Aircraft characteristics – Airport Site Selection, Airport Classification, Planning of Airfield Components – Runway, Taxiway, Apron, Hanger, Passenger Terminals.

UNIT IV RAILWAY ENGINEERING**9**

Railway Industry – Privatization – Financing – Competition with Road Transport - Urban Rail Transit Planning – MRTS – LRTS, Metro Rail – Monorail – Network Design, Capacity and Traffic Forecasting - Case Studies.

UNIT V WATERWAYS TRANSPORT SYSTEMS**9**

Fresh Water and Salt Water Navigation – Ocean, Currents and Tide – Canals and Waterways – Ports – Types of Ships - Inland Water Transport – Planning, limitations and advantages – Case Studies – Pipelines – Ropeways – Beltways – other means of transport – Characteristics and Applications

TOTAL: 45 PERIODS**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:

1. Kadiyali L.R, "Traffic Engineering and Transportation Planning" Khanna Publishers, Delhi, 2005.
2. Khanna SK and Justo CEG, "Highway Engineering", Nem Chand & Bros, Roorkee, 2010.
3. Brase/Brase "Understandable Statistics 3rd edition", D C Health and Company, Lexington, Massachusetts, Toronto, 1987.
4. Jason C.yu, Transportation Engineering: Introduction to Planning, Design and Operations, Elsevier, 1992.
5. Taylor M.A.P and Young W, Traffic Analysis-New Technology and New solutions, Hargreen Publishing Company, 1998.
6. Nicholas J. Garben and Lester A Hoel, "Traffic and Highway Engineering", PWS Publication, 1999.
7. Partha Chakraborty and Animesh Das, "Principle of Traffic Engineering", Prentice Hall of India, New Delhi, 2003.
8. Flaherty, "Transportation Planning and Traffic Engineering", Elsevier India Pvt Ltd., 2006.
9. Mike Slinn, Peter Guest and Paul Matthews "Traffic Engineering Design Principles and Practice", Elsevier, 2006.

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**

Design of slender columns - Design of RC walls. Strut and tie method of analysis for corbels and deep beams , Design of corbels, Deep-beams and grid floors.

UNIT II DESIGN OF STEEL STRUCTURES**9**

Introduction to Direct Strength Method - Behaviour of Compression Elements - Effective width for load and deflection determination – Behaviour of Unstiffened and Stiffened Elements – Design of webs of beams – Flexural members – Lateral buckling of beams – Shear Lag – Flange Curling – Design of Compression Members – Wall Studs.

UNIT III ANALYSIS AND DESIGN OF INDUSTRIAL BUILDINGS 9
Loads on Industrial buildings – gravity load, Live load, wind load and Earthquake load – configuration of various industrial buildings, Need for large column free areas – various types of floors, roofs and roof coverings. Analysis and design of different types of trusses – Analysis and design of industrial buildings – Sway and non-sway frames – airport structures – harbor structures – A seismic design of steel buildings.

UNIT IV TALL BUILDING 9
The Tall Building in the Urban Context - The Tall Building and its Support Structure - Development of High Rise Building Structures - General Planning Considerations. Dead Loads - Live Loads-Construction Loads -Snow, Rain, and Ice Loads - Wind Loads-Seismic Loading – Water and Earth Pressure Loads - Loads - Loads Due to Restrained Volume Changes of Material - Impact and Dynamic Loads - Blast Loads -Combination of Loads.

UNIT V ANALYSIS AND DESIGN OF SPECIAL STRUCTURES 9
Approximate Analysis of Bearing Wall Buildings The Cross Wall Structure - The Long Wall Structure The Rigid Frame Structure Approximate Analysis for Vertical Loading - Approximate Analysis for Lateral Loading - Approximate Design of Rigid Frame Buildings-Lateral Deformation of Rigid Frame Buildings The Rigid Frame - Shear Wall Structure - The Vierendeel Structure - The Hollow Tube Structure.

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:

1. Gambhir.M. L., “Design of Reinforced Concrete Structures”, Prentice Hall of India, 2012.
2. Purushothaman, P, “Reinforced Concrete Structural Elements: Behaviour Analysis and Design”, Tata McGraw Hill, 1986
3. Unnikrishna Pillai and Devdas Menon “Reinforced Concrete Design’, Third Edition, Tata McGraw Hill Publishers Company Ltd., New Delhi, 2007.
4. Varghese, P.C, “Advanced Reinforced Concrete Design”, Prentice Hall of India, 2005.
5. Varghese, P.C., “Limit State Design of Reinforced Concrete”, Prentice Hall of India, 2007.
6. Lynn S. Beedle, Plastic Design of Steel Frames, John Wiley and Sons, 1990.
7. Narayanan.R.et.al., Teaching Resource on Structural steel Design, INSDAG, Ministry of Steel Publishing, 2000.
8. Subramanian.N, Design of Steel Structures, Oxford University Press, 2014.
9. Wie Wen Yu, Design of Cold Formed Steel Structures, McGraw Hill Book Company, 1996
10. Taranath B S, “Structural Analysis and Design of Tall Buildings” Tata McGraw Hill Education Pvt Ltd, New Delhi, 2011

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

A Historical Overview of Infrastructure Privatization. The Benefits of Infrastructure Privatization, Problems with Infrastructure Privatization, Challenges in Privatization of Water Supply: A Case Study, Challenges in Privatization of Power: Case Study, Privatization of Infrastructure in India: Case Study, Privatization of Road Transportation Infrastructure in India.

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

Information Technology and Systems for Successful Infrastructure Management, - Innovative Design and Maintenance of Infrastructure Facilities, Infrastructure Modeling and Life Cycle Analysis Techniques, Capacity Building and Improving the Governments Role in Infrastructure Implementation, An Integrated Framework for Successful Infrastructure Planning and Management - Infrastructure Management Systems and Future Directions.

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:

- Grigg, Neil, Infrastructure engineering and management, Wiley, (1988).
- Haas, Hudson, Zaniewski, Modern Pavement Management, Krieger, Malabar, (1994).
- Hudson, Haas, Uddin, Infrastructure management: integrating design, construction, maintenance, rehabilitation, and renovation, McGraw Hill, (1997).

4. Munnell, Alicia, Editor, Is There a Shortfall in Public Capital Investment? Proceedings of a Conference Held in June (1990).
5. World Development Report 1994: Infrastructure for Development (1994).
6. Zimmerman, K. and F. Botelho, "Pavement Management Trends in the United States," 1st European Pavement Management Systems Conference, Budapest, September (2000).

IM5111

TESTING AND PROJECT MANAGEMENT LAB

**L T P C
0 0 4 2**

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.
6. Resource leveling.
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 :

1. Harris P.E., Project Management using Primavera, Eastern Harris Publications, 2nd Edition,2008.
2. M.S. Project – Microsoft Press, 1st Edition,2003

REFERENCES :

3. Harris P.E., Project Management using Primavera, Eastern Harris Publications, 2nd Edition,2008.
4. M.S. Project – Microsoft Press, 1st Edition,2003

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

Introduction – Concept- Growth – Role and function. Manpower Planning for Construction Companies – Line and Staff function. Recruitment, selection, placement, induction and training; over staffing; Time office and establishment functions; wage and salary administration – Discipline- Separation Process.

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

Objectives – Regularity agent, owner, design, contract and construction oriented objectives, methods – Techniques and needs of QA/QC – Different aspects of quality – Appraisals, 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.

UNIT IV QUALITY MANAGEMENT IN CONSTRUCTION 9

Importance of quality; Elements of quality- quality characteristics- quality by design - quality conformance, contractor quality control- identification and traceability, Continuous Chain Management – brief concept and application. Importance of specifications- Incentives and penalties in specifications – Workmanship as a mark of quality – Final Inspection. Quality assurance techniques – Inspection, testing, sampling. Documentation – Organization for quality control, Cost of quality.

UNIT V TOTAL QUALITY MANAGEMENT 9

Techniques and needs of QA/QC – Different aspects of quality – Appraisals, 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. Introduction to TQM, Six Sigma Concept.

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:

1. James, J.O' Brian, "Construction Inspection Handbook" – Total Quality Management, Van Nostrand, 1997
2. John L. Ashford, "The Management of Quality in Construction", E & F. N. Spon, 1989.
3. Juran Frank, J.M. and Gryna, F.M. "Quality Planning and Analysis", McGraw Hill, 2001

4. Kwaku.A., Tena, Jose, M. Guevara, "Fundamentals of Construction Management and Organisation", Reston Publishing Co., Inc., 1985.
5. Steven McCabe, "Quality Improvement Techniques in Construction", Addison Wesley Longman Ltd, 1998.
6. Dale H.Besterfield, "Total Quality Management", Pearson Education Asia, (Indian reprint 2011).
7. John Bank, The essence of total quality management PHI 2000.
8. Greg Bounds, Lyle Yorks et al, Beyond Total Quality Management, McGraw Hill, 1994.
9. Takashi Osada, The 5S's The Asian Productivity Organization, 1991.

IM5202

**GEOGRAPHICAL INFORMATION SYSTEMS FOR
INFRASTRUCTURE PLANNING**

**L T P C
2 2 0 3**

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 12

Maps – Definition – Scale - Types of Maps – Elements of Map – Projection – purpose - types – Coordinate Systems: Geographic, Rectangular and Polar – Transformations - types and application – GIS: Introduction - History– Components – Applications of GIS - Popular GIS software – Opensource GIS software

UNIT II DBMS AND GIS DATA MODEL 12

Database Management system – function – types – advantages - Entity Relationship Model - Normalization - GIS Data Model - Introduction- Data Encoding - Vector Data Structure - Raster Data structure – Network Data Structure - Comparison of Vector and Raster Data Structure - ODBC

UNIT III GIS DATA INPUT 12

Sources for GIS Data - Vector Data Input – Georeferencing – Topology – Topological Relationship - Raster Data Input – Errors in input – Data Editing – Linking Attribute Data – Raster File Formats – Vector File Formats – Raster to Vector and Vector to Raster Conversion - OGC standards

UNIT IV GIS DATA ANALYSIS 12

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 12

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

TOTAL:60 PERIODS

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 |
| CO5 | Present the spatial information along with quality assessment for applications |

TEXT BOOKS

1. Jonathan Campbell and Michael Shin, Essentials of Geographic Information Systems, 2011, **Saylor Foundation**, ISBN: 9781453321966
2. Michael N. DeMers, **Fundamentals of Geographic Information Systems, 4th Edition, 2009**, Wiley, ISBN: 9780470129067

IM5203

URBAN ENVIRONMENTAL MANAGEMENT

L T P C
3 0 0 3

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 9

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 9

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 9

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 9

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.

UNITV MUNICIPAL SOLID WASTE MANAGEMENT 9

Sources of solid waste - characteristics - rate of generation - segregation at source - collection of solid waste-methods of collection-route analysis-transfer and transfer stations - processing and disposal of solid waste. Case Studies-Environmental economics- Social and Physiological aspects of pollution- Successful Urban Management - models- Urban Management-Case studies from Developed Nations - Software

TOTAL : 45 PERIODS

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

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:

1. Murthy, V.N.S., "Advanced Foundation Engineering", CBS Publishers & Distributors, New Delhi, 2007.
2. Purushothama Raj, P., Ground Improvement Techniques, Laxmi Publications (P) Ltd., New Delhi, 2007
3. Tomlinson M.J., Pile Design and Construction Practice, Fourth Edition, E & FN SPON an imprint of Chapman & Hall.
4. Das, B.M., Principles of Foundation Engineering, Sixth Edition, India Edition, Homson, 2007.
5. Hans-George Kempfert & Berhane Gebreselassie. Excavation and Foundations in soft soils, Springer.

IM5211**GIS LABORATORY****L T P C**
0 0 4 2**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:

1. H. Robinson et al, Elements of Cartography, 7th Edition, John Wiley and Sons, 2004.
2. C.P. Lo Albert K.W. Yeung, "Concepts and Techniques of Geographic Information Systems", Prentice Hall of India Publishers, 2006.

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**9**

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

UNIT II TENDERS**9**

Prequalification – Bidding – Accepting – Evaluation of Tender from Technical, Contractual and Commercial Points of View – Contract Formation and Interpretation – Potential Contractual Problems – World Bank Procedures and Guidelines – Tamilnadu Transparency in Tenders Act.

UNIT III ARBITRATION**9**

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

UNIT IV LEGAL REQUIREMENTS**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 Government Laws for Approval – Statutory Regulations.

UNIT V LABOUR REGULATION**9**

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

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:

- Gajaria G.T., Laws Relating to Building and Engineering Contracts in India,
- Jimmie Hinze, Construction Contracts, McGraw Hill, 2001.
- Joseph T. Bockrath, Contracts and the Legal Environment for Engineers and Architects, McGraw Hill, 2000.
- Kwaku, A., Tenah, P.E. Jose M.Guevara, P.E., Fundamentals of Construction Management and Organisation, Printice Hall, 1985.M.M.Tripathi Private Ltd., Bombay, 1982.
- Patil. B.S, Civil Engineering Contracts and Estimates, Universities Press (India) Private Limited, 2006.

OBJECTIVES :

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

UNIT I INTRODUCTION**9**

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**9**

Green projects in smart cities, sustainability – green building – Rating system – Energy efficient building – energy saving systems.

UNIT III SMART URBAN TRANSPORT SYSTEMS**9**

Elements of Infrastructure (Physical, Social, Utilities and services), Basic definitions, concepts, significance and importance; Data required for provision and planning of urban networks and services; Resource analysis, Provision of infrastructure. Role of transport, types of transport systems, evolution of transport modes, transport problems and mobility issues. Urban form and Transport patterns, land use – transport cycle, concept of accessibility. Hierarchy, capacity and geometric design elements of roads and intersections. Basic principles of Transport infrastructure design. Urban transport planning process –Transport, environment and safety issues. Principles and approaches of Traffic Management, Transport System Management.

UNIT IV WATER SUPPLY AND DRAINAGE**9**

Water – sources of water, treatment and storage, transportation and distribution, quality, networks, distribution losses, water harvesting, recycling and reuse, norms and standards of provision, institutional arrangements, planning provisions and management issues. Sanitation – points of generation, collection, treatment, disposal, norms and standards, grey water disposal, DEWATS, institutional arrangements, planning provisions and management issues. Municipal and other wastes –generation, typology, quantity, collection, storage, transportation, treatment, disposal, recycling and reuse, wealth from waste, norms and standards, institutional arrangements, planning provisions and management issues. Power – Sources of power procurement, distribution networks, demand assessment, norms and standards, planning provisions and management issues

UNIT V E- GOVERNANCE AND IOT**9**

The concept of management, concept of e-management & e-business, e-Government Principles, Form e-Government to e-governance, e-governance and developing countries, Designing and Implementing e-Government Strategy, E governance: Issues in implementation. IOT-fundamentals, protocols, design and development, data analytics and supporting services, case studies.

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 stake holders 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.

CO 5 Identify and recognize the role of ICT and data analytics in addressing the urban challenges and key issues

REFERENCES:

1. Allen G.Noble, (Eds), 'Regional Development and Planning for the 21st Century: New Priorities and New Philosophies', Aldershot, USA, 1988.
2. Andy Pike, Andres Rodriguez-Pose, John Tomaney, 'Handbook of Local and Regional Development', Taylor & Francis, 2010
3. Andreas Faludi and Sheryl Goldberg, 'Fifty years of Dutch National Physical Planning, Alexandrine Press, Oxford, 1991.
4. Daniel G. Parolek, AIA, Karen Parolek, Paul C. Crawford, FAICP, Form Based Codes: A Guide for Planners, Urban Designers, Municipalities, and Developers, John Wiley & Sons, 2008

ST5001

MAINTENANCE AND REHABILITATION OF STRUCTURES

L T P C
3 0 0 3

OBJECTIVE:

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

UNIT I INTRODUCTION

9

General Consideration – Distresses monitoring – Causes of distresses – Quality assurance – Defects due to climate, chemicals, wear and erosion – Inspection – Structural appraisal – Economic appraisal.

UNIT II BUILDING CRACKS

9

Causes – diagnosis – Thermal and Shrinkage cracks – unequal loading – Vegetation and trees – Chemical action – Foundation movements – Remedial measures - Techniques for repair – Epoxy injection.

UNIT III MOISTURE PENETRATION

9

Sources of dampness – Moisture movement from ground – Reasons for ineffective DPC – Roof leakage – Pitched roofs – Madras Terrace roofs – Membrane treated roofs - Leakage of Concrete slabs – Dampness in solid walls – condensation – hygroscopic salts – remedial treatments – Ferro cement overlay – Chemical coatings – Flexible and rigid coatings.

UNIT IV DISTRESSES AND REMEDIES

9

Concrete Structures: Introduction – Causes of deterioration – Diagnosis of causes – Flow charts for diagnosis – Materials and methods of repair – repairing, spalling and disintegration – Repairing of concrete floors and pavements.

Steel Structures : Types and causes for deterioration – preventive measures – Repair procedure – Brittle fracture – Lamellar tearing – Defects in welded joints – Mechanism of corrosion – Design of protect against corrosion – Design and fabrication errors – Distress during erection.

Masonry Structures: Discoloration and weakening of stones – Biotical treatments – Preservation – Chemical preservatives – Brick masonry structures – Distresses and remedial measures.

UNIT V STRENGTHENING OF EXISTING STRUCTURES

9

General principle – relieving loads – Strengthening super structures – plating – Conversation to composite construction – post stressing – Jacketing – bonded overlays – Reinforcement addition – strengthening substructures – under pinning – Enhancing the load capacity of footing – Design for rehabilitation.

TOTAL: 45 PERIODS

OUTCOME:

- 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:

1. Allen R.T and Edwards S.C, "Repair of Concrete Structures", Blakie and Sons, UK, 1987
2. Dayaratnam.P and Rao.R, "Maintenance and Durability of Concrete Structures", University Press, India, 1997.
3. Denison Campbell, Allen and Harold Roper, "Concrete Structures, Materials, Maintenance and Repair", Longman Scientific and Technical, UK, 1991.
4. Dodge Woodson.R,"Concrete Structures – protection, repair and rehabilitation", Elsevier Butterworth – Heinmann, UK, 2009.
5. Hand book on seismic retrofit of Building by CPWD and IIT Madras,2003.
6. Peter H.Emmons, "Concrete Repair and Maintenance Illustrated", Galgotia Publications Pvt. Ltd., 2001.
7. Raikar, R.N., "Learning from failures - Deficiencies in Design, Construction and Service" – Rand D Centre (SDCPL), Raikar Bhavan, Bombay, 1987.

IM5001**MODERN CONSTRUCTION MATERIALS AND TECHNOLOGY****L T P C
3 0 0 3****OBJECTIVES :**

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

UNIT I SPECIAL CONCRETES**9**

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

UNIT II METALS**9**

Types of Steels – Manufacturing process of steel – Advantages of new alloy steels – Properties and advantages of aluminum and its products – Types of Coatings & Coatings to reinforcement – Applications of Coatings.

UNIT III COMPOSITES AND OTHER MATERIALS**9**

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:**9**

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:**9**

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.
2. Aitkens, High Performance Concrete, McGraw Hill,1999
3. Ashby, M.F. and Jones.D.R.H.H. "Engineering Materials 1: An introduction to Properties, applications and designs", Elsevier Publications,2005.
4. Deucher, K.N, Korfiatis, G.P and Ezeldin, A.S, Materials for civil and Highway Engineers, Prentice Hall Inc.,1998.
5. Ganapathy, C. "Modern Construction Materials", Eswar Press,2015.
6. Mamlouk, M.S. and Zaniewski, J.P., Materials for Civil and Construction Engineers, Prentice Hall Inc.,1999.
7. Santhakumar.A.R. "Concrete Technology", Oxford University press, New Delhi.
8. Shan Somayaji, Civil Engineering Materials, Prentice Hall Inc., 2001
9. Shetty M.S, Concrete Technology: Theory and Practice, S.Chand & Company Ltd.,2005.
9. Jerry Irvine, "Advanced Construction Techniques", C.A. Rocketr, 1984
10. Sankar S.K. and Saraswathi. S, "Construction Technology", Oxford University Press, New Delhi, 2008.

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:**9**

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: 9

ABC,FSN, VED, SOS analysis- Procedure and its use, Standardization in materials and their management, Procurement, identification of sources of procurement, vendor analysis. Vendor analysis concept of (MRKP) Material requirement planning, planning, purchase procedure, legal aspects.

UNIT III INVENTORY MANAGEMENT**9**

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:**9**

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**9**

Conventional methods of quality control of Construction materials. Statistical method of quality control, Sampling techniques quality control in process. Quality Management and its economics. Project procurement processes. Use of (MMS) – Materials Management Systems in materials planning, procurement, inventory control, cost control etc. Project evaluation: Discounted Cash Flow, Real Options Theory. Project delivery methods, Competitive bidding. Risk allocation and management. Integrated project delivery. Contract negotiation.

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

1. "A Guide to the Project Management Body of Knowledge (PMBOK Guide) - Fourth Edition, An American National Standard, ANSI/PMI 990001-2008"
2. Chitale A.K. and R.C. Gupta, "Material Management – Text and Cases", Prentice Hall of India Pvt. Ltd., 2007
3. Denise Bower, "Management of Procurement", Construction Management Series, Thomas Telford Publishing, 2003
4. Joseph Philips, PMP, Project Management and Professional (Certification Study Guides), McGraw Hill Publication, 2013
5. Jhamb L.C., "Inventory Management", Everest Publishing house, 2005
6. Menon K.S., "Purchasing and Inventory Control", Wheeler Publication, 1993
7. Ministry of Rural Development, GOI, "Procurement Manual", National Rural Livelihoods Project, 2010
8. Peter Holm Andreasen, "Dynamics of Procurement Management – A Complexity Approach", Copenhagen Business School, 2012
9. Peter Baily, David Farmer, Barry Crocker, David Jessop & David Jones, "Procurement Principles and Management", FT Prentice Hall, 2010
10. Manual for Ministry of Roads, Transport and Highways (MoRTH), GOI, 2007, 4th Revision

ST5009**PRESTRESSED CONCRETE****L T P C
3 0 0 3****OBJECTIVE:**

- Principle of prestressing, analysis and design of prestressed concrete structures.

UNIT I PRINCIPLES OF PRESTRESSING**9**

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:

1. Arthur H. Nilson, "Design of Prestressed Concrete", John Wiley and Sons Inc, New York, 2004.
2. Krishna Raju, "Prestressed Concrete", Tata McGraw Hill Publishing Co., New Delhi, 2008.
3. Lin.T.Y.,and Burns.H "Design of Prestressed Concrete Structures", John Wiley and Sons Inc, New York, 2009.
4. Rajagopalan.N, "Prestressed Concrete", Narosa Publications, New Delhi, 2008.
5. Sinha.N.C.and.Roy.S.K, "Fundamentals of Prestressed Concrete", S.Chand and Co., 1998.

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	9
Real Estate - Investment Property, Equipment Replace Analysis, Depreciation – Tax before and after depreciation – Value Added Tax (VAT) – Inflation.		
UNIT IV	FUNDS MANAGEMENT	9
Project Finance – Sources of finance - Long-term and short -term finance, Working Capital Management, Inventory valuation, Mortgage Financing - International financial management-foreign currency management.		

UNIT V FUNDAMENTALS OF MANAGEMENT ACCOUNTING 9

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

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:

1. Blank, L.T., and Tarquin,a.J (1988) Engineering Economy,4th Edn. Mc-Graw Hill Book Co.
2. Collier C and GlaGola C (1998) Engineering Economics & Cost Analysis, 3rd Edn. Addison Wesley Education Publishers.
3. Patel, B M (2000) Project management- strategic Financial Planning, Evaluation and Control, Vikas Publishing House Pvt. Ltd. New Delhi.
4. Shrivastava,U.K., (2000)Construction Planning and Management,2nd Edn. Galgotia Publications Pvt. Ltd. New Delhi.
5. Steiner, H.M. (1996) Engineering Economic principles, 2nd Edn. Mc-Graw Hill Book, New York.

**IM5003 SUSTAINABLE DEVELOPMENT AND URBAN PLANNING L T P C
3 0 0 3**

OBJECTIVES :

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

UNIT I INTRODUCTION TO SUSTAINABLE DEVELOPMENT: 9

Definitions and principles of Sustainable Development - History and emergence of the concept of Sustainable Development - Environment and Development linkages- Globalization and environment – Millennium Development Goals: Status (global and Indian) - Impacts on approach to development policy and practice in India, future directions.

UNIT II ENVIRONMENTAL SUSTAINABILITY: 9

Land, Water and Food production - Moving towards sustainability: Energy powering Sustainable Development - Financing the environment and Sustainable Development.

UNIT III EMPOWERMENT: 9

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: 9

Environment and Resources, Sustainability Assessment, Future Scenarios, Form of Urban Region, Managing the change, Integrated Planning, Sustainable Development

UNIT V THE BUILT IN ENVIRONMENT:**9**

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

1. Gilg A W and Yarwood R, "Rural Change and Sustainability - Agriculture, the Environment and Communities", CABI Edited by S J Essex, September 2005.
2. Ganesha Somayaji and Sakarama Somayaji, "Environmental Concerns and Sustainable development: Some perspectives from India", Editors:, publisher TERI Press, ISBN 8179932249.
3. James H. Weaver, Michael T. Rock, Kenneth Kustere, "Achieving Broad-Based Sustainable Development: Governance, Environment, and Growth with Equity", Kumarian Press, West Hartford, CT. Publication Year, 1997.
4. Kirkby. J, O'Keefe P. and Timberlake, "Sustainable development" Earth Scan Publication, London, 1996.
5. Kerry Turner. R, "Sustainable Environmental Management", Principles and Practice Publisher: Belhaven Press, ISBN: 1852930039.
6. Munier N, "Introduction to Sustainability", Springer 2005

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**9**

Sustainable Development challenges and need- Key approaches for Impact Assessment Assessing Environmental Impacts - E I A 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, E I A 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, S I A 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- C B A , Social C B A ,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

1. Canter,L.W., "EnvironmentalImpactAssessment", McGrawHill, NewYork, 1996.
2. Anjaneyulu, Yerramilli, and Valli Manickam, "Environmental impact assessment methodologies", Hyderabad: BS Publications, 2007.
3. Lawrence, D.P., "Environmental Impact Assessment - Practical Solutions to recurrent problems", Wiley-Interscience, New Jersey, 2003.
4. Petts, J., "Handbook of Environmental Impact Assessment', Vol., I and II, Blackwell science, London, 1999.

IM5005**PAVEMENT ANALYSIS DESIGN AND EVALUATION****L T P C
3 0 0 3****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:**9**

Various Aspects of Surface and their Importance; Causes, Factors Affecting, Deterioration and measures to Reduce, Riding Quality : Measurement of Skid Resistance, Unevenness, Ruts and Cracks. Pavement Surface Condition Evaluation by Physical Measurements, by Riding Comfort and Other Methods; their Applications. Surface unevenness-Bump Integrator.

UNIT II PAVEMENT STRUCTURE & ITS EVALUATION:**9**

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 : 9

Pavement Overlays, Design of Flexible Overlay over Flexible Pavement by Benkelman Beam Deflection and other Methods. Flexible Overlays and Rigid Overlays over Rigid Pavements, Design procedures for rigid pavement – Slab thickness, dowel bar, tie bar, spacing of joints – IRC guidelines – Airfield pavements – Comparison of highway and airfield pavements- Use of Geosynthetics in Pavement Overlays.

UNIT IV PAVEMENT MANAGEMENT SYSTEM: 9

Concepts of pavement management systems, pavement performance prediction – concepts, modeling techniques, structural conditional deterioration models. HDM.

UNIT V PAVEMENT EVALUATION AND REHABILITATION: 9

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
- CO2 Describe Pavement Structure and its Evaluation
- CO3 Design Pavement Overlays
- CO4 Explain Pavement Management System
- CO5 Explain different models and optimization methodologies

REFERENCES:

1. Shahin, M Y, Pavement Management for Airport, Roads and Parking lots, Chapman and Hall, 1st Ed.,1994
2. Huang, Yang H., Pavement Analysis and Design, Prentice Hall, 3rd Ed.,2009.
3. Babkov, Road Conditions and Traffic Safety, Mir Publications, 1st Ed.,1975
4. Woods, K.B., Highway Engineering Hand Book, McGraw Hill Book Co., 1st Edition,1960
5. David Croney, The Design and Performance of Road Pavements, HMSO Publications, 2nd Edition,1991
6. Haas and Hudson, Pavement Management System, McGraw Hill Book Co., New York, 2nd Edition,1978
7. Per Ullitz, Pavement Analysis, Elsevier, Amsterdam, 1st Edition,1987
8. HRB/TRB/IRC/International Conference on Structural Design of Asphalt Pavements, 2000
9. "Guideline for the Design of Rigid Pavements for Highways", IRC:58-1998, The Indian Roads Congress, New Delhi.
10. O' Flaherty, C.A., "Highways – The location, Design, Construction & Maintenance of Pavements", Fourth Edition, Elsevier, 2006
11. Yoder R.J and Witchak M.W., "Principles of Pavement Design", John Wiley, 2000.

OBJECTIVES:

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

UNIT I CONSTRUCTION ACCIDENTS**9**

Accidents and their Causes – Human Factors in Construction Safety – Costs of Construction Injuries – Occupational and Safety Hazard Assessment – Legal Implications.

UNIT II SAFETY PROGRAMMES**9**

Problem Areas in Construction Safety – Elements of an Effective Safety Programme – Job-Site Safety Assessment – Safety Meetings – Safety Incentives.

UNIT III CONTRACTUAL OBLIGATIONS**9**

Safety in Construction Contracts – Substance Abuse – Safety Record Keeping.

UNIT IV DESIGNING FOR SAFETY**9**

Safety Culture – Safe Workers – Safety and First Line Supervisors – Safety and Middle Managers – Top Management Practices, Company Activities and Safety – Safety Personnel – Sub contractual Obligation – Project Coordination and Safety Procedures – Workers Compensation.

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:

1. Jimmy W. Hinze, "Construction Safety", Prentice Hall Inc., 1997.
2. Richard J. Coble, Jimmie Hinze and Theo C. Haupt, Construction Safety and
3. Tamilnadu Factory Act, Department of Inspectorate of factories, Tamilnadu. Health Management, Prentice Hall Inc., 2001

OBJECTIVE:

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

UNIT I EARTHQUAKE GROUND MOTION**9**

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	9
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	9
Structural Systems - Types of Buildings - Causes of damage - Planning Considerations - Philosophy and Principle of Earthquake Resistant Design - Guidelines for Earthquake Resistant Design - Earthquake Resistant Masonry Buildings - Design consideration – Guidelines.		
UNIT IV	EARTHQUAKE RESISTANT DESIGN OF RC STRUCTURES	9
Earthquake Resistant Design of R.C.C. Buildings - Material properties - Lateral load analysis – Capacity based Design and detailing – Rigid Frames – Shear walls.		
UNIT V	VIBRATION CONTROL TECHNIQUES	9
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:

1. Brebbia C. A., "Earthquake Resistant Engineering Structures VIII", WIT Press, 2011
2. Bruce A Bolt, "Earthquakes" W H Freeman and Company, New York, 2004.
3. Duggal S K, "Earthquake Resistant Design of Structures", Oxford University Press, 2007.
4. Mohiuddin Ali Khan "Earthquake-Resistant Structures: Design, Build and Retrofit", Elsevier Science & Technology, 2012
5. Pankaj Agarwal and Manish Shrikhande, "Earthquake Resistant Design of Structures", Prentice Hall of India, 2009.
6. Paulay, T and Priestley, M.J.N., "Seismic Design of Reinforced Concrete and Masonry buildings", John Wiley and Sons, 1992.

IM5007	DISASTER MITIGATION AND MANAGEMENT	L T P C
		3 0 0 3

OBJECTIVES :

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

UNIT I	INTRODUCTION	9
Hazards and disaster, phases of Disaster Management , Types of disasters, Hydrological, Coastal and Marine Disasters, Atmospheric Disasters, Geological, Mass Movement and Land Disasters, Wind and Water Driven Disasters. Vulnerability, Risks Assessment.		

UNIT	EARTHQUAKE DISASTER	9
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 9
Introduction- Causes , Effects on buildings, protection measures from damage to buildings , Flood, cyclone, Tsunami zone map , Mitigation Strategies

UNIT IV NUCLEAR DISASTER 9
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 9
Legal frame work ,Institutional mechanism of Disaster Management , Schemes and Grants on Disaster Management , Recommendation of 13th finance commission , Plan, Non plan Schemes – Externally Aided schemes , Effects of natural hazards on economy & Development , Collapsed Structure rescue stages , Economic vulnerability – Role of Policy makers in disaster risk , Role of NDRF in Disaster Management , Medical First Responder , Collapsed structure Search & Rescue , Flood Rescue & Relief Management

TOTAL : 45 PERIODS

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 guide lines 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

1. Annual Report, Ministry of Home Affairs, Government of India,2009-10
2. Ayaz Ahmad, "Disaster Management: Through the New Millennium" Anmol Publications, 2003
3. Berg.GV, "Seismic Design codes and procedures", EERI,CA,1982
4. Booth, Edmund, "Concrete Structures in earthquake regions; Design and Analysis", Longman,1994
5. Dowrick. D.J, "Earthquake resistant design for Engineers and Architects", John Wiley & Sons,Second Edition, 1987.
6. Ghosh G.K. "Disaster Management", A.P.H. Publishing Corporation,2006
7. Goel, S. L. "Encyclopaedia of Disaster Management", Deep & Deep Publications Pvt Ltd., 2006
8. Jaikrishna & A.R.Chandrasekaran, "Elements of Earthquake Engineering", Sarita Prakashan,Meerut,1996
9. Singh R.B, "Disaster Management", Rawat Publications,2008
10. 13th Finance Commision Report,Ministry of Finance, Government of India, 2010-1

OBJECTIVES :

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

UNIT I INTRODUCTION**9**

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**9**

Estimation of product Quality/performance-Types of functions- Relationship between Use functions and Esteem Functions in product design – Functional cost and Functional Worth – Effect of Value improvement on profitability-Test for poor value –Aims of Systematic Approach.

UNIT III JOB PLAN**9**

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-Annuity concept- Net Present value-Pay back period-Internal rate of return on Investment (IRR)-Examples and Illustrations.

UNIT IV RELIABILITY ESTIMATION**9**

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**9**

General Phase-Information Phase – Type of costs- Function Phase – Evaluation of Functional Relationships- Checks for consistency-Function –cost-weight-matrix-VIP Index – High cost and Poor value areas- Creativity/Speculation Phase – Rules of creativity-Brainstorming- Idea activators- Result accelerators – Evaluation Phase – Estimation of costs of ideas- Evaluation by comparison.

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

- Arthur E Mudge, "Value Engineering", McGraw Hill Book Company, 1971
- A.D.Raven, Profit Improvement through Value Analysis, value Engineering and Purchase Price Analysis, Cassell and Co. London. (1971)
- Richard J Park, "Value Engineering – A Plan for Inventions", St.Lucie Press, London,1999
- S S Iyer," Value Engineering – A How to Manual", 3rd edition, New Age Publishers, Chennai, ISBN: 978-81-224-2405-8,2006
- Value engineering, Mukhopadhyaya, Anil Kumar, Response Books, New Delhi , ISBN: 0-7619-9788-1, 2003.

