

**PAAVAI ENGINEERING COLLEGE, (AUTONOMOUS)**

**B.E. CIVIL ENGINEERING**

**REGULATIONS 2019**

**(CHOICE BASED CREDIT SYSTEM)**

**(For Students Admitted in the Academic year 2020-2021)**

**SEMESTER – VII**

S. No	Category	Course Code	Course Title	L	T	P	C
<b>Theory</b>							
1	HS	BA20151	Entrepreneurship Development	3	0	0	3
2	PC	CE20701	Estimation, Costing and Valuation Engineering	3	0	0	3
3	PC	CE20702	Irrigation Engineering	3	0	0	3
4	PE	CE2045*	Professional Elective IV	3	0	0	3
5	OE	CE2090*	Open Elective II	3	0	0	3
<b>Practical</b>							
6	PC	CE20703	Irrigation and Environmental Engineering Drawing	0	0	4	2
7	EE	CE20704	Summer Training**	0	0	2	1
8	EE	CE20705	Mini Project	0	0	6	3
<b>Total</b>				<b>15</b>	<b>0</b>	<b>12</b>	<b>21</b>

\*\* (2 weeks during 6<sup>th</sup> Semester Summer Holidays)

**SEMESTER VIII**

S.No	Category	Course Code	Course Title	L	T	P	C
<b>Theory</b>							
1	PC	CE20801	Construction Management	3	0	0	3
2	PE	CE2055*	Professional Elective V	3	0	0	3
3	PE	CE2065*	Professional Elective VI	3	0	0	3
<b>Practical</b>							
4	EE	CE20802	Project Work	0	0	12	6
<b>Total</b>				<b>9</b>	<b>0</b>	<b>12</b>	<b>15</b>



## LIST OF PROFESSIONAL ELECTIVES

### PROFESSIONAL ELECTIVE IV

Category	Course Code	Course Title	L	T	P	C
PE	CE20451	Prestressed Concrete Structures	3	0	0	3
PE	CE20452	Geographic Information System	3	0	0	3
PE	CE20453	Ground Improvement Techniques	3	0	0	3
PE	CE20454	Hydrology	3	0	0	3

### PROFESSIONAL ELECTIVE V

Category	Course Code	Course Title	L	T	P	C
PE	CE20551	Prefabricated Structures	3	0	0	3
PE	CE20552	Air Pollution and Control Engineering	3	0	0	3
PE	CE20553	Bridge Engineering	3	0	0	3
PE	CE20554	Advanced Concrete Design	3	0	0	3

### PROFESSIONAL ELECTIVE VI

Category	Course Code	Course Title	L	T	P	C
PE	CE20651	Construction Resource Planning and Management	3	0	0	3
PE	CE20652	Maintenance, Repair and Rehabilitation of Structures	3	0	0	3
PE	CE20653	Tall Buildings	3	0	0	3
PE	CE20654	Geo Environmental Engineering	3	0	0	3

## LIST OF OPEN ELECTIVES

### OPEN ELECTIVE II

Category	Course Code	Course Title	L	T	P	C
OE	CE20903	Contract Laws and Regulations	3	0	0	3
OE	CE20904	Disaster Management	3	0	0	3





## SEMESTER VII

BA20151

### ENTREPRENEURSHIP DEVELOPMENT (Common to all B. E & B.Tech Program (R 2019))

3 0 0 3

#### COURSE OBJECTIVES

To enable the students to,

- understand the Management principles.
- build the entrepreneurial competencies and analyse the support rendered by government and other agencies in entrepreneurship development.
- understand the business opportunities and to prepare a Feasibility Report.
- propose a business plan.
- appraise and comprehend the various factors to be considered for launching a small business.

#### UNIT I Basics of Management

9

**Management:** Meaning, Definition, Nature and Importance; Roles of management - Functions of Management - Levels of Management - Functional areas of Management: Marketing, Finance, Production, HRM, IT, R and D.

**The Evolution and Development of Management Thought:** Classical, Neo - classical, System and Contingency Approaches - An Overview.

#### UNIT II Entrepreneurial Competence and Environment

9

**Entrepreneurial Competence:** Entrepreneurship - Definition, Role and expectations - Entrepreneurial styles and types - Characteristics of the Entrepreneur - Entrepreneurial Competencies - Functions of an Entrepreneur.

**Entrepreneurial Environment:** Role of Socio-Cultural, Economic and Political Environment - Institutional Support for small entrepreneurs, Assistance Programme for Small Scale Units - Institutional Framework, Central and State Government Industrial Policies and Regulations.

#### UNIT III Entrepreneurial Development

9

Ownership Structures - Proprietorship, Partnership, Company, Co-operative, Franchise. Identification of Business Opportunity - Preparation of Feasibility Report - Financial and Technical Evaluation - Project Formulation - Common Errors in Project Formulation - Specimen Project Report Entrepreneurial Development Programs - Role of SSI Sector in the Economy - IAS Units - Failure, Causes and Preventive Measures - Turnaround Strategies.

#### UNIT IV Business Plan Preparation, Financing Ventures

9

**Business Plan:** Business opportunities-SWOT, Business plan process, Feasibility Study, Functional plan- Marketing plan, Operational plan, Organizational plan, financial plan, Evaluation Criteria.

**Financing ventures:** sources of raising capital, seed funding, venture capital funding, funding opportunities for startups in India.



**Women Entrepreneurship:** Growth of women Entrepreneurship – Problems faced by Women Entrepreneurs – Development of women Entrepreneurship.

**Entrepreneurship in Informal Sector:** Rural Entrepreneurship – Entrepreneurship in Sectors like Agriculture, Tourism, Health care, Transport and allied services.

**TOTAL PERIODS** 45

### COURSE OUTCOMES

At the end of this course, the students will be able to

- implement the necessary managerial skills to become an entrepreneur.
- take up self-employment having been exposed to entrepreneurial environment.
- select a best business idea by using appropriate methods to assess its viability.
- formulate a business plan and deploy the resources for sustainable growth.
- analyse channels and means of launching a small business in any sector.

### TEXTBOOKS

1. Khanka S.S, "Entrepreneurial Development", S. Chand and Company Limited, New Delhi, 2016.
2. Saravanavel. P, "Entrepreneurial Development", Ess Pee Kay Publishing House, Chennai, 2013.

### REFERENCES

1. Donald L. Sexton and Raymond W. Smilor, "The Art and Science of Entrepreneurship", Ballinger Publishing Company, 2008.
2. Clifford M. Baumbach and Joseph R. Mancuso, "Entrepreneurship and Venture Management", Prentice Hall, 1975.
3. Gifford Pinchot, "Intrapreneuring" Harper and Row Publishers, New York, 2005.
4. Mathew Manimala, "Entrepreneurship Theory at the Crossroads", Paradigms and Praxis, Biztrantra, 2nd Edition, 2015.
5. Prasanna Chandra, "Projects – Planning, Analysis, Selection, Implementation and Reviews", Tata McGraw-Hill, 2013.
6. P.C. Jain, "Handbook for New Entrepreneurs", EDII, Oxford University Press, New Delhi, 2012.

### CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	3	1	-	2	2	2	-	2	3	2	3
CO2	-	2	2	-	2	1	-	-	-	-	1	1	1	3
CO3	-	1	1	-	1	1	1	-	1	1	1	3	-	3
CO4	1	1	-	-	-	-	1	-	3	1	1	3	1	2
CO5	1	1	1	-	1	1	2	-	2	1	-	3	-	1





**COURSE OBJECTIVES**

To enable the students to,

- estimate the quantities of item of works involved in buildings and arches.
- prepare the estimation of sanitary works and other works.
- assess the concept of rate analysis.
- study the valuation of properties and buildings.
- know about the tender and report preparation.

**Prerequisite: Nil**

**UNIT I ESTIMATION OF BUILDINGS 9**

Types of estimates - Units of measurements, Methods of estimates, Load bearing and framed structures, Calculation of quantities of various items for residential building with flat roof; Various types of arches - Calculation of brick work in arches; Estimating of steps.

**UNIT II ESTIMATION OF OTHER STRUCTURES 9**

Doors and windows (paneled and glazed); Estimating of septic tank - soak pit; Estimate of bituminous and cement concrete roads; Estimate of retaining walls; Estimate of culverts.

**UNIT III SPECIFICATIONS AND ANALYSIS OF RATES 9**

Specifications - Sources, Detailed and general specifications, Measurement book.; Rate for material and labour - Rate analysis for stone masonry, brick masonry, concreting, plastering and tiles laying; PWD Schedule of rates.

**UNIT IV VALUATION 9**

Basics of valuation - Capitalized value, Factors affecting the value of plot and building, Depreciation, Valuation of residential building, Escalation, Calculation of standard rent; Mortgage - Lease.

**UNIT V TENDERS AND REPORT PREPARATION 9**

Tenders - e Tendering; Contracts - Types of contracts, Arbitration and legal requirements; Principles for report preparation - Report on estimate of residential building, Culvert, Roads, Water supply and sanitary installations.

**TOTAL PERIODS 45**

**COURSE OUTCOMES**

Upon the completion of this course, the students will be able to

- compute quantities of various items for load bearing and framed structures.
- calculate the quantities of various items for other structures.
- analyse the rates for various items of works.
- carry out valuation of plots and buildings.
- prepare tenders, contract documents and reports as per norms.

## TEXTBOOKS

1. Dutta, B.N., "Estimating and Costing in Civil Engineering", UBS Publishers and Distributors Pvt. Ltd., 28th Revised Edition, 2016.
2. Kohli, D. D and Kohli, R.C., "A Text Book of Estimating and Costing (Civil)", S.Chand and Company Ltd., 2004

## REFERENCES

1. Tamil Nadu PWD Data Book- 2017.
2. Tamil Nadu Transparencies in Tender Act, 1998 Tamil Nadu Transparency in Tenders Rules, 2000 and Tamil Nadu Transparency in Tenders (Public Private Partnership Procurement) Rules, 2012.
3. Standard Bid Evaluation Form, Procurement of Goods or Works, The World Bank, April 1996
4. Arbitration and Conciliation Act, 1996

## CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	1	2	1	-	1	-	2	2	3	3
CO2	3	3	3	1	1	2	1	-	1	-	2	2	3	3
CO3	3	3	3	1	1	2	1	-	1	-	2	2	3	3
CO4	3	3	3	1	1	2	1	-	1	-	2	2	3	3
CO5	3	3	3	1	1	2	1	-	1	-	2	2	3	3





**COURSE OBJECTIVES**

To enable the students to,

- gain basic knowledge on national water policy structure
- familiar basic requirements of crop water
- acquire the basic concepts in the design principles of impounding structures
- update their knowledge about canal irrigation
- know about the various irrigation water management

**Prerequisite:** Nil

**UNIT I IMPORTANCE OF IRRIGATION****9**

Purpose and benefits of Irrigation; Historical background; National Water Policy; Standards of Irrigation water; Consumptive use of water; Duty, Delta, Base period, factors affecting duty; Water requirement by crops; Irrigation efficiency; Irrigation scheduling

**UNIT II METHODS OF IRRIGATION****9**

Classification of irrigation methods - types of surface irrigation, furrow irrigation, border strip irrigation, basin irrigation, merit and demerits of subsurface irrigation; Tank irrigation; Lift irrigation; Micro-irrigation - Sprinkler irrigation, Drip irrigation, Fertigation.

**UNIT III DIVERSION AND IMPOUNDING STRUCTURES****9**

Diversion Head works - Weirs and Barrages; Types of impounding structures - Factors affecting location of dams, Gravity dams, Forces on a gravity dam, Earth dams, Arch dams, Spillways, Energy dissipaters.

**UNIT IV CANAL IRRIGATION****9**

Classification of canals - Alignment of canals; Canal Head works; Canal regulators; Canal drops; Canal Outlets - Escapes; Lining and maintenance of canals; Kennedy's and Lacey's Regime theory; Cross drainage works.

**UNIT V WATER LOGGING AND DRAINAGE****9**

Causes, ill effects and control of water logging; Objectives of drainage - types of drainage, drainage materials and pipes, advantages and maintenance of tile drains, Layout and installation of drains.

**TOTAL PERIODS 45****COURSE OUTCOMES**

Upon the completion of this course, the students will be able to

- describe the national water policy structure and soil plant water characteristics
- describe the basics of requirements and estimation of crop water
- design the various types of hydraulic structure includes dams, spillways and dissipaters
- design the components of irrigation canal includes canal drops and cross drainage works
- apply the concepts of Irrigation water management, water user association for participatory irrigation management

## TEXTBOOKS

1. Garg, S.K., "Irrigation Engineering," Laxmi Publications, New Delhi, 2008
2. Sharma, R.K., and Sharma, T.K., "Irrigation Engineering", S. Chand and Company, New Delhi, 2008.

## REFERENCES

1. Arora, K.R., "Irrigation, Water Power and Water Resources Engineering", Standard Publishers Distributors, New Delhi, 2009.
2. Basak, N.N., "Irrigation Engineering", Tata McGraw-Hill Publishing Co, New Delhi, 2008.
3. Dilip Kumar Majumdar, "Irrigation Water Management", Prentice-Hall of India, New Delhi, 2008.
4. Punmia, B.C., "Irrigation and Water Power Engineering", Laxmi Publishers, New Delhi, 2008.

## CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2	2	2	2	2	-	-	2	2	2	2
CO2	3	2	1	2	2	2	2	2	-	-	2	2	2	2
CO3	3	2	1	2	2	2	2	2	-	-	2	2	2	2
CO4	3	2	1	2	2	2	2	2	-	-	2	2	2	2
CO5	3	2	1	2	2	2	2	2	-	-	2	2	2	2





**COURSE OBJECTIVES**

To enable the students to,

- design and draw the canal drop, canal regulator in detail which showing the plan, elevation and sections.
- gain knowledge about various structural behaviour of gravity dam.
- design and draw the coagulation and sedimentation tank in detail which showing the plan, elevation and sections.
- design and draw the rapid sand filter in detail which showing the plan, elevation and sections.

**Prerequisite: Water Supply and Irrigation Engineering**

**LIST OF EXPERIMENTS****PART A: IRRIGATION ENGINEERING**

1. Design and drawing of canal regulator.
2. Design and drawing of vertical drop weir.

**PART B: ENVIRONMENTAL ENGINEERING**

3. Design and drawing of coagulation and sedimentation tank.
4. Design and drawing of rapid sand filter
5. Design and drawing of screen chamber and grit chamber.
6. Design and drawing of septic tank.
7. Design and drawing of trickling filter

**TOTAL PERIODS 60**

**COURSE OUTCOMES**

Upon the completion of this course, the students will be able to

- design and draw a canal drop, canal regulator
- design and draw a gravity dam.
- design and draw coagulation and sedimentation tank structures
- design and draw rapid sand filter.

**TEXTBOOKS**

1. Garg, S.K., "Irrigation Engineering and Design of Structures", New Age International Publishers, New Delhi, 1997.
2. Manual on "Sewerage and Sewage Treatment Systems- Part A, B and C" CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013.

## REFERENCES

1. Raghunath, H.M. "Irrigation Engineering", Wiley India Pvt. Ltd., New Delhi, 2011
2. Sharma R.K., "Irrigation Engineering and Hydraulic Structures", Oxford and IBH Publishing Co., New Delhi, 2002
3. Metcalf and Eddy, "Wastewater Engineering, Treatment and Reuse", Tata McGraw-Hill, New Delhi, 2010.
4. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 1999.

## CO PO MAPPING:

Mapping of Course Objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3–Strong, 2–Medium, 1–Weak														
COS	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	-	2	3	-	3	2	-	2	2	2
CO2	2	1	2	2	-	2	3	-	3	2	-	2	2	2
CO3	2	1	2	2	-	2	3	-	3	2	-	2	2	2
CO4	2	1	2	2	-	2	3	-	3	2	-	2	2	2





CE20704

**SUMMER TRAINING**

0 0 2 1

(2 Weeks during VI Semester Summer Holiday)

**COURSE OBJECTIVES**

To enable the students to,

- train the students in field work so as to have first-hand knowledge of practical problems in carrying out engineering tasks.
- develop skills in facing and solving the field problems.

**Prerequisite: Nil****Strategy:**

The students individually undertake training in reputed civil engineering companies for the specified duration. At the end of the training, a report on the work done will be prepared and presented. The students will be evaluated through a viva-voce examination by a team of internal staff.

**TOTAL PERIODS 30****COURSE OUTCOMES**

Upon the completion of this course, the students will be able to

- understand the intricacies of implementation textbook knowledge into practice
- understand the concepts of developments and implementation of new techniques

**CO PO MAPPING:**

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	2	2	2	2	2	3	3	2	3	3	2
CO2	2	3	3	2	2	2	2	2	3	3	2	3	3	2



**COURSE OBJECTIVES**

To enable the students to,

- make use of the knowledge gained by the student at various semester.
- understand the various procedures for validation of the project.
- the degree course and formulate a real-world problem and project's goals.
- analyse for the cost effectiveness

**GUIDELINES**

1. The students are expected to get formed into a team of convenient groups of not more than 4 members for a project.
2. Every project team shall have a guide who is the member of the faculty of the institution. Identification of student group and their faculty guide need to be completed within the first two weeks from the day of the beginning of 7<sup>th</sup> semester.
3. The group has to identify and select the topic to be addressed as their project work.
4. Three reviews and end semester review of the progress of the project work have to be conducted by a team of faculty (minimum 3 and a maximum of 5) along with their faculty guide.

This evaluation will form 50% of the internal assessment mark. The remaining 50% of the external assessment mark will be given at the end of the 7<sup>th</sup> semester, at the time of completing the full project work.

**TOTAL PERIODS 90**

**COURSE OUTCOMES**

Upon the completion of this course, the students will be able to

- formulate a real-world problem.
- identify the requirement and develop the design solutions.
- test and validate through conformance of the developed prototype.
- analysis the cost effectiveness.

**CO PO MAPPING:**

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3





## SEMESTER VIII

CE20801

CONSTRUCTION MANAGEMENT

3 0 0 3

### COURSE OBJECTIVES

To enable the students to,

- make them understand the concepts of construction management for planning to execution of projects.
- gain knowledge on the feasibility analysis in construction management and network analysis tools for cost
- know the labour productivity and material management.
- understand the quality and safety in construction.
- study the construction disputes and legislation

**Prerequisite:** Nil

#### UNIT I CONSTRUCTION PROJECTS MANAGEMENT FRAMEWORK 9

Introduction - Scope, Concept and Features, Project characteristics, project development, Phases and process, Feasibility study, project management practice and organization, Project manager role and competency skills, Main causes of project failure, Importance of integrated planning, scheduling and controlling; Planning - Steps involved in planning, Objective, Principles, Stages of planning, Types of plan stages of planning in different agencies.

#### UNIT II SCHEDULING, JOB LAYOUT AND NETWORKS 9

Scheduling - Definition, Preparation of construction schedule, Classification of scheduling, Methods of Scheduling; Job layout - Work break down structure, Line balance technique; Network - Definition, Objectives, Interrelationship of events and activities, Dummy activities, Function, Provision and uses, Types of networks, Choice of network, Assumptions, Rules for drawing a network, Fulkerson's rule for numbering and events, Advantages of network technique.

#### UNIT III PLANNING CONSTRUCTION MANPOWER, MATERIALS AND EQUIPMENT 9

Establishing workers productivity standards - Scheduling construction site workers, Grouping project manpower, Designing workers financial incentive scheme; ABC classification of construction materials - materials wastage standards, Materials provisioning process, Materials inventory basics, Inventory planning process; Financing aspects of construction plants and equipment - Factors affecting selection of construction equipment

#### UNIT IV QUALITY CONTROL AND SAFETY MANAGEMENT 9

Quality - Importance of quality, Elements of quality, Quality characteristics, Design quality, Quality of conformance, Organisation for quality control, Quality assurance techniques, Inspection, Testing, Sampling, Documentation, Quality control circles; Safety - Importance of safety - Causes of accidents, Responsibility for safety, Safety measures, Role of various parties in safety management, Safety Benefits

to employers, Employees and customer, Approaches to improve safety in construction, Measuring techniques.

## UNIT V CONSTRUCTION DISPUTES, LABOUR AND LEGISLATION

9

Disputes – Introduction, Development of disputes, Categories of disputes, Modes of settlement and disputes; Payment wages act; Minimum wages act; Labour Welfare Fund act; Workmen's compensation act.

**TOTAL PERIODS 45**

### COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- identify the various types of planning and contractors.
- analyses the strategic planning and risks.
- exposure to utilization of construction resources.
- realize the achievements of quality and safety in construction.
- identify the categories of dispute and legislation

### TEXTBOOKS

1. Chitkara, K.K. "Construction Project Management: Planning, Scheduling and Control", Tata McGraw-Hill Publishing Company, New Delhi, 2009.
2. Seetharaman S "Construction Engineering and Management", Umesh Publications, New Delhi, 2015.

### REFERENCES

1. Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders", Prentice Hall, Pittsburgh, 2000.
2. Frederick E. Gould, "Construction Project Management", Wentworth Institute of Technology, Vary E. Joyce, Massachusetts Institute of Technology, 2000.
3. George J.Ritz, "Total Construction Project Management" - McGraw-Hill Inc, 1994.
4. P.S.Gahlot., "Construction Planning and Management"-New age international,2007

### CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	2	-	2	2	2	-	-	3	2	2	2
CO2	3	2	-	2	-	2	2	2	-	-	3	2	2	2
CO3	3	2	-	2	-	2	2	2	-	-	3	2	2	2
CO4	3	2	-	2	-	2	2	2	-	-	3	2	2	2
CO5	3	2	-	2	-	2	2	2	-	-	3	2	2	2





**COURSE OBJECTIVES**

To enable the students to,

- develop ability to identify problems and solve through project works.
- get exposure to literature review related to identified problem and finding the gap to solve through project work.
- get exposure to required design procedure, experimental setup, analysis package to solve the identified problem.

**GUIDELINES**

1. The students are expected to get formed into a team of convenient groups of not more than 4 members for a project.
2. Every project team shall have a guide who is the member of the faculty of the institution. Identification of student group and their faculty guide need to be completed within the first two weeks from the day of the beginning of 8<sup>th</sup> semester.
3. The group has to identify and select the problem to be addressed as their project work and study literature survey to finalize a comprehensive aim and scope of their work.
4. Three reviews and end semester review of the progress of the project work have to be conducted by a team of faculty (minimum 3 and a maximum of 5) along with their faculty guide as a member the review team.

This evaluation will form 50% of the internal assessment mark. The remaining 50% of the external assessment mark will be given at the end of the 8<sup>th</sup> semester, at the time of completing the full project work.

**TOTAL PERIODS 180**

**COURSE OUTCOMES**

Upon the completion of this course, the students will be able to

- identify feasible problems to solve through project works
- collect literature through research journals and identify the gap in selected area
- devise the methodology to find solution through gathering complete knowledge on materials/design procedure/analysis and optimization techniques/availability of experimental setup/company permission and other documentation procedures to execute the project

**CO PO MAPPING:**

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3



## PROFESSIONAL ELECTIVE IV

CE20451

### PRESTRESSED CONCRETE STRUCTURES

3 0 0 3

#### COURSE OBJECTIVES

To enable the students to,

- impart knowledge on the basic principles of prestressed concrete structures
- understand the loss and deflection of prestressed concrete members.
- gain knowledge in design of flexure and anchorage zone design.
- understand the performance of composite and continuous members.
- gain knowledge on various prestressed concrete structural elements

**Prerequisite:** Nil

#### UNIT I INTRODUCTION

9

Basic concepts of prestressing - Need for High strength steel and concrete; Terminology - Advantages of prestressed concrete, Applications of prestressed concrete, Materials for prestressed concrete, Prestressing systems; Analysis of prestress and bending stresses - Stress, strength and load balancing concept.

#### UNIT II LOSSES AND DEFLECTION OF PRESTRESSED CONCRETE MEMBERS

9

Losses -Types of losses - Elastic shortening, Shrinkage of concrete, Creep of concrete, Friction, Anchorage slip, Relaxation of steel; Deflections of prestressed concrete members - Factors affecting deflection, Effect of tendon profile on deflections, short and long term deflection - Check for serviceability limit state of deflection

#### UNIT III DESIGN OF FLEXURAL MEMBERS AND ANCHORAGE ZONES

9

Behaviour of flexural members - Determination of ultimate flexural strength as per BIS, Design concepts of flexural members; Design for shear based on BIS; Anchorage zone - Concepts of bond stress, Determination of anchorage zone stresses in post-tensioned beams - IS code method, Design of anchorage zone reinforcement.

#### UNIT IV COMPOSITE BEAMS AND CONTINUOUS BEAMS

9

Analysis and design of composite beams - Shrinkage strain and its importance; Methods of achieving continuity in continuous beams; Analysis for secondary moments - Concordant cable and linear transformation, Calculation of stresses, Principles of design.

#### UNIT V CIRCULAR PRESTRESSING

9

General Aspects - Analysis and design, IS Codal provisions, Circular Prestressing - Analysis and design of prestressed concrete tanks; Design of prestressed concrete pipes; Partial Prestressing – Definition, Methods of achieving partial prestressing, Merits and demerits of partial prestressing.

**TOTAL PERIODS** 45



## COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- gain knowledge on principles of prestressed concrete structures
- understand about losses of prestressed concrete structures and deflection in beams
- design for flexure and shear on prestressed concrete beams and the anchorage zone for post tensioned members.
- design composite members and continuous beams.
- design various prestressed concrete structural elements

## TEXTBOOKS

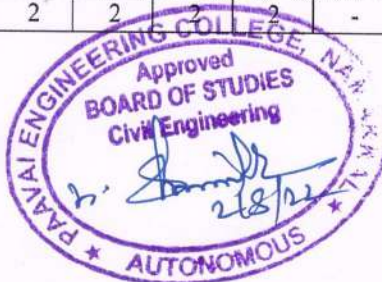
1. Krishna Raju N., Prestressed concrete, Tata McGraw Hill Company, fifth edition, 2012
2. Pandit.G.S. And Gupta.S.P. Prestressed Concrete, CBS Publishers and Distributors Pvt. Ltd., Second edition, 2014

## REFERENCES

1. Lin T.Y. and Ned.H. Burns, "Design of prestressed Concrete Structures", John Wiley and Sons, 3rd Edition, 2010.
2. Dayaratnam.P., Sarah P, "Prestressed Concrete Structures", Seventh Edition, Oxford and IBH, 2017.
3. Rajagopalan.N, "Prestressed Concrete", Narosa Publishing House, 2010
4. Sinha.N.C. And Roy.S.K. "Fundamentals of Prestressed Concrete", S.Chand and Co. Ltd., 2011.
5. IS1343 - 2016 - IS Code of Practice for Prestressed Concrete.
6. IS784 - 2001 - IS Specification for Prestressed Concrete Pipes
7. IS3370 - 2008 - Part III – IS Code of Practice for Concrete Structures for the storage of liquids
8. IS1678 - 1998 - Specification for Prestressed Concrete Pole for overhead Power Traction and Telecommunication lines.

## CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	2	2	2	2	2	-	-	-	2	3	2
CO2	3	2	-	2	2	2	2	2	-	-	-	2	3	2
CO3	3	2	-	2	2	2	2	2	-	-	-	2	3	2
CO4	3	2	-	2	2	2	2	2	-	-	-	2	3	2
CO5	3	2	-	2	2	2	2	2	-	-	-	2	3	2



**COURSE OBJECTIVES**

To enable the students to,

- understand the fundamental concept of GIS.
- gain knowledge about various data models and data structures.
- understand the concepts of different data input formats and topology.
- get knowledge about standards of data quality.
- understand data management functions and data output.

**Prerequisite:** Nil

**UNIT I FUNDAMENTALS OF GIS****9**

Introduction to GIS - Basic spatial concepts, Coordinate systems; GIS and Information Systems - Definitions, History of GIS, Components of a GIS - Hardware, Software, Data, People, Methods; Proprietary and open source Software; Types of data - Spatial, Attribute data - types of attributes; Scales - levels of measurements.

**UNIT II SPATIAL DATA MODELS****9**

Database Structures - Relational, Object oriented, Entities, ER diagram; Data models - conceptual, logical and physical models, spatial data models; Raster data structures - Raster data compression, Vector data structures; Raster vs Vector models; TIN and GRID data models.

**UNIT III DATA INPUT AND TOPOLOGY****9**

Scanner - Raster data Input, Raster data File Formats, Georeferencing, Vector data input, Digitizer; Datum projection and reprojection; Coordinate transformation - Topology, Adjacency, Connectivity and Containment; Topological consistency; Non topological file formats; Attribute data linking - Linking external databases; GPS data integration

**UNIT IV DATA QUALITY AND STANDARDS****9**

Data quality - Basic aspects - completeness, logical consistency, positional accuracy, temporal accuracy, thematic accuracy and lineage; Metadata; GIS standards; Interoperability; OGC - Spatial data Infrastructure.

**UNIT V DATA MANAGEMENT AND OUTPUT****9**

Import/Export - Data management functions, Raster to Vector and Vector to Raster conversion, Data output, Map compilation, Chart/Graphs; Multimedia - Enterprise vs Desktop GIS, distributed GIS.

**TOTAL PERIODS 45****COURSE OUTCOMES**

Upon the completion of this course, the students will be able to

- have basic idea about the fundamentals of GIS.
- understand the types of data models.
- get knowledge about data input and topology.



- gain knowledge on data quality and standards.
- understand data management functions and data output.

#### TEXTBOOKS

1. Jonathan Campbell and Michael Shin, Essentials of Geographic Information Systems, 2011, Saylor Foundation, ISBN: 9781453321966
2. Ian Heywood, Sarah Cornelius, Steve Carver, An Introduction to Geographical Information Systems, 4th Edition, 2011, Prentice Hall, ISBN: 9780273722595

#### REFERENCES

1. Paul A. Longley, Michael F. Goodchild, David J. Maguire, David W. Rhind, Geographic Information Science and Systems, 4th Edition, 2015, Wiley, ISBN: 9781118676950
2. David Smith, Understanding GIS - An ArcGIS Pro Project Workbook, 4th Edition, 2018, Environmental Systems Research, ISBN: 9781589485266
3. Kang-tsung Chang, "Introduction to Geographic Information Systems", 9th Edition, 2019, McGraw-Hill Book Company, ISBN: 9781259929649
4. Michael N. DeMers, Fundamentals of Geographic Information Systems, 4th Edition, 2009, Wiley, ISBN: 9780470129067

#### CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	3	2	2	1	-	1	2	2	1	2
CO2	3	2	1	-	3	2	2	1	-	1	2	2	1	2
CO3	3	2	1	-	3	2	2	1	-	1	2	2	1	2
CO4	3	2	1	-	3	2	2	1	-	1	2	2	1	2
CO5	3	2	1	-	3	2	2	1	-	1	2	2	1	2



**COURSE OBJECTIVES**

To enable the students to,

- develop an awareness of problematic soils and selection of ground improvement techniques
- understand drainage and dewatering methods.
- know about the compaction and consolidation behavior of the soils.
- study the concepts and applications of earth reinforcement.
- know about the suitable grouting techniques for various types of soils.

**Prerequisite: Nil**

**UNIT I PROBLEMATIC SOIL AND IMPROVEMENT TECHNIQUES 9**

Role of ground improvement in foundation engineering - methods of ground improvement, Emerging trends in ground Improvement, Suitability and feasibility of ground improvement techniques, Geotechnical problems in alluvial, lateritic and black cotton soils, Selection of suitable ground improvement techniques based on soil conditions.

**UNIT II DEWATERING 9**

Hydraulic modification - Dewatering Techniques - Well points, Vacuum and electroosmotic methods; Seepage analysis for two-dimensional flow for fully and partially penetrated slots in homogeneous deposits.

**UNIT III INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS 9**

Insitu densification of cohesion less soils and consolidation of cohesive soils; Dynamic compaction vibro flotation, Sand compaction piles and deep compaction, Consolidation; Drains - Preloading with sand drains, fabric drains; Stone columns and Lime piles - Installation techniques, Simple design, Relative merits of above methods and their limitations.

**UNIT IV EARTH REINFORCEMENT 9**

Concept of reinforcement - Types of reinforcement material; Reinforced earth wall - Mechanism, Simple design, Applications of reinforced earth; Role of Geotextiles - Filtration, Drainage, Separation, Road works and containment.

**UNIT V GROUT TECHNIQUES 9**

Types of grouts - Grouting equipment and machinery, Injection methods; Grout monitoring - stabilization with cement, lime and chemicals, stabilization of expansive soil; Selection of grout - Design aspects

**TOTAL PERIODS 45**

**COURSE OUTCOMES**

Upon the completion of this course, the students will be able to

- identify the problematic soil and select the suitable ground improvement techniques.
- determine the seepage analysis of the soil
- get knowledge on in-situ treatment of cohesionless and cohesive soil



- understand the concept of earth reinforcement and design of reinforced earth.
- gain knowledge about the various grouting techniques.

#### TEXTBOOKS

1. Mittal.S, "An Introduction to Ground Improvement Engineering", Medtéch Publisher, 2013.
2. Purushothama Raj. P, "Ground Improvement Techniques", Firewall Media, 2005.

#### REFERENCES

1. Moseley, M.P., "Ground Improvement Blockie Academic and Professional", Chapman and Hall, Glasgow, 1998.
2. Koerner, R.M. "Construction and Geotechnical Methods in Foundation Engineering", McGraw Hill, 1994.
3. Jones J.E.P. "Earth Reinforcement and Soil Structure", Butterworths, London, 1985.
4. IS 13094: Selection of ground improvement techniques for foundation in weak soils - Guidelines -1992

#### CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	-	2	2	2	-	-	-	-	2	2	-
CO2	2	2	1	-	2	2	2	-	-	-	-	2	2	-
CO3	2	2	1	-	2	2	2	-	-	-	-	2	2	-
CO4	2	2	1	-	2	2	2	-	-	-	-	2	2	-
CO5	2	2	1	-	2	2	2	-	-	-	-	2	2	-



**COURSE OBJECTIVES**

To enable the students to,

- have good understanding of all the components of the hydrological cycle
- gain knowledge about the estimation of runoff
- realize the importance of flood control and mitigation measures
- study reservoir and its classification
- understand the dynamics of ground water flow and their implication

**Prerequisite:** Nil

**UNIT I PRECIPITATION AND ABSTRACTIONS**

9

Hydrological cycle - Meteorological measurements, Requirements, Types and forms of precipitation; Rain gauges - Spatial analysis of rainfall data using Thiessen and Isohyetal methods; Interception - Evaporation, Horton's equation, Pan evaporation measurements and evaporation suppression; Infiltration - Horton's equation - Double ring infiltrometer, Infiltration indices; Measurement of infiltration - Abstraction loss.

**UNIT II RUNOFF**

9

Watershed - Catchment and basin, Catchment characteristics; Factors affecting runoff - Runoff estimation using empirical; Strange's table and SCS methods; Stage discharge relationships flow measurements; Hydrograph - Unit Hydrograph, IUH, Applications

**UNIT III FLOOD AND DROUGHT**

9

Natural Disasters - Flood estimation - Gumbel's method, Log pearson type III method; Frequency analysis - Flood control; Definitions of droughts - Meteorological, Hydrological and agricultural droughts; IMD method, NDVI analysis - Drought prone area programme (DPAP).

**UNIT IV RESERVOIRS**

9

Classification of reservoirs - General principles of design, Site selection, spillways, elevation, Area capacity, Storage estimation, sedimentation; Life of reservoirs - Rule curve.

**UNIT V GROUNDWATER AND MANAGEMENT**

9

Origin - Classification and types, Properties of aquifers, Governing equations; Steady and unsteady flow - Artificial recharge, RWH in rural and urban areas; Seawater intrusion; Discharge in a confined and unconfined aquifer, Leaky aquifer, well loss, aquifer loss.

**TOTAL PERIODS 45****COURSE OUTCOMES**

Upon the completion of course, the students will be able to

- estimate the mean areal precipitation and their significance in design of various hydraulic structures.
- calculate the runoff and measurements of flow
- estimate the flood by various methods and concept of flood routing.
- confess about the various classification of reservoirs
- perceive the dynamics of ground water flow and their estimation



## TEXTBOOKS

1. Subramanya .K. "Engineering Hydrology" – Tata McGraw Hill, 4<sup>th</sup> Edition, 2017
2. Jayarami Reddy .P. "Hydrology", Tata McGraw Hill, 3<sup>rd</sup> Edition, 2016.

## REFERENCES

1. David Keith Todd. "Groundwater Hydrology", John Wiley and Sons, Inc. 2007
2. VenTe Chow, Maidment, D.R. and Mays, L.W. "Applied Hydrology", McGraw Hill International Book Company, 2010
3. Raghunath .H.M., "Hydrology", Wiley Eastern Ltd., 2004
4. Linsley, R.K. and Franzini, J.B. "Water Resources Engineering", McGraw Hill International Book Company, 2010.

## CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	-	2	2	3	-	-	-	2	2	2	1
CO2	2	2	2	-	2	2	3	-	-	-	2	2	2	1
CO3	2	2	2	-	2	2	3	-	-	-	2	2	2	1
CO4	2	2	2	-	2	2	3	-	-	-	2	2	2	1
CO5	2	2	2	-	2	2	3	-	-	-	2	2	2	1



## PROFESSIONAL ELECTIVE V

CE20551

### PREFABRICATED STRUCTURES

3 0 0 3

#### COURSE OBJECTIVES

To enable the students to,

- impart the basic knowledge about prefabrication and modular coordination
- familiar with prefabricated components
- acquire the basic concepts design principles of prefabrication
- update their knowledge about joints in structural members
- know about production and erection techniques

**Prerequisite:** Nil

#### UNIT I INTRODUCTION

9

Need for prefabrication - Principles, Materials; Modular co-ordination; Standardization; Systems production - Transportation, Erection.

#### UNIT II PREFABRICATED COMPONENTS

9

Behaviour of structural components - Large panel construction; Application of prestressing of roof members; Floor systems - Two-way load bearing slabs; Wall panels - Shear walls, segmental constructions

#### UNIT III DESIGN PRINCIPLES

9

Disuniting of Structures; Design of cross section based on efficiency of material used - Problems in design because of joint flexibility, Allowance for joint deformation.

#### UNIT IV JOINTS IN STRUCTURAL MEMBERS

9

Dimensioning and detailing of joints for different structural connections - Construction joints and expansion joints; Joints for different structural connections - Beam to column, Beam to beam, Column to column, Column to foundation, Connections between wall panels, Connections between floor panels

#### UNIT V ERECTION OF STRUCTURES

9

Production - Transportation and erection, Organizing of production; Storing and erection equipment - Shuttering and mould design; Dimensional tolerances - erection of R.C. structures, Total prefabricated buildings.

**TOTAL PERIODS 45**

#### COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- gain knowledge about prefabrication and principles of modular coordination
- understand about the usage of prefabrication components
- understand the basic concepts design principles of prefabrication
- describe about various joints in structural members
- understand various erection techniques



## TEXTBOOKS

1. Hubert Bachmann, Alfred Steinle, "Precast Concrete Structures", Ernst and Sohn GMBH and Co., K.G., 2011
2. Laszlo Makk, Prefabricated Concrete for Industrial and Public Structures, Akademiai Kiado, Budapest, 1964.

## REFERENCES

1. Handbook on Precast Concrete for Buildings, ICI Bulletin 02, First Edition, 2016
2. PCI Design Hand Book, 6th Edition, 2004..
3. Lewicki B, "Building with Large Prefabricates", Elsevier Publishing Company, Amsterdam London / New York, 1966
4. Levi M, (2000), Precast concrete materials, Manufacture properties and usage, Applied Science Publishers, London.

## CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	2	2	2	-	-	2	2	2	2
CO2	3	3	2	2	-	2	2	2	-	-	2	2	2	2
CO3	3	3	2	2	-	2	2	2	-	-	2	2	2	2
CO4	3	3	2	2	-	2	2	2	-	-	2	2	2	2
CO5	3	3	2	2	-	2	2	2	-	-	2	2	2	2



**COURSE OBJECTIVES**

To enable the students to,

- impart the knowledge on sources, effect and control of air pollution.
- know the principles of dispersion characteristics of pollution in atmosphere
- impose the knowledge on the control of particulate pollutants.
- know the concepts behind the gaseous pollutants management.
- deliver the sources, effect and control of indoor air quality.

**Prerequisite:** Nil

**UNIT I SOURCES AND EFFECTS OF AIR POLLUTANTS 9**

Structure and composition of Atmosphere; Air Pollution – Definition, Scope, Scales of air pollution, Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility; Ambient Air Quality and Emission standards; Ambient; stack sampling and analysis of particulate and gaseous pollutants.

**UNIT II ATMOSPHERIC DISPERSION OF AIR POLLUTANTS 9**

Effects of meteorology on air pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns; Atmospheric diffusion theories - Dispersion models, Plume rise.

**UNIT III CONTROL OF PARTICULATE CONTAMINANTS 9**

Gas particle interaction - Working principle, Design and performance equations of gravity separators, Centrifugal separators Fabric filters, Particulate scrubbers, Electrostatic precipitators, Operational considerations, Factors affecting selection of control equipment.

**UNIT IV CONTROL OF GASEOUS CONTAMINANTS 9**

Control of gaseous contaminants - Working principle, Design and performance equations of absorption, Adsorption, Condensation, Incineration, Bio scrubbers; Bio filters - Process control and Monitoring, Operational considerations, Factors affecting selection of control equipment - CO<sub>2</sub> capturing.

**UNIT V AIR QUALITY MANAGEMENT 9**

Air quality standards; Air quality monitoring - Preventive measures, Air pollution control efforts, Zoning, Town planning regulation of new industries; Legislation and enforcement - Environmental impact assessment on air quality; Indoor air pollutants – Sources, types and control measures; Sick building - syndrome types.

**TOTAL PERIODS 45**

**COURSE OUTCOMES**

Upon the completion of this course, the students will be able to

- classify the sources and effects of air pollution.
- realize the dispersion characteristics and modeling of air pollution.
- know about particulate air pollutant control methods



- apply on the gaseous air pollutant management ideas.
- aware with the sources, effects and control of indoor air pollution.

#### TEXTBOOKS

1. Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, Air Pollution Control Engineering, Tokyo, 2004
2. Noel de Nevers, Air Pollution Control Engineering, Mc Graw Hill, New York, 2017

#### REFERENCES

1. David H.F. Liu, Bela G. Liptak „Air Pollution“ ,Lweis Publishers, 2000.
2. Arthur C.Stern, „Air Pollution (Vol.I – Vol.VIII)“ , Academic Press, 2006.
3. Wayne T.Davis, „Air Pollution Engineering Manual“ , John Wiley and Sons, Inc.,2000.
4. Anjaneyulu. Y, “Air Pollution and Control Technologies”, Allied Publishers (P) Ltd., India 2002

#### CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3-strong, 2-Medium,1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	2	-	3	3	2	-	-	2	2	2	2
CO2	3	3	-	2	-	3	3	2	-	-	2	2	2	2
CO3	3	3	-	2	-	3	3	2	-	-	2	2	2	2
CO4	3	3	-	2	-	3	3	2	-	-	2	2	2	2
CO5	3	3	-	2	-	3	3	2	-	-	2	2	2	2



**COURSE OBJECTIVES**

To enable the students to,

- introduce the basic fundamentals of bridge.
- familiarize with design of slab culverts, the beam and slab bridges.
- explain the principles of continuous bridges and composite bridges.
- gain knowledge on fundamentals of bearings used in bridges.
- get exposure on the conceptual knowledge on bridge maintenance.

**Prerequisite:** Nil

**UNIT I INTRODUCTION TO BRIDGE**

9

Historical background of bridges and types - Bridge aesthetics and proportioning, Design process Review of applicable design codes, Loads on bridges and force distribution Bridge geometry, Selection of Bridge site; Conceptual design - Classification of bridges; Bridge hydrology; Determination of design discharge - linear water way, economical Span, location of piers and abutments, afflux, scour depth.

**UNIT II SLAB AND T- BEAM BRIDGES**

9

Design of slab bridges - General design considerations, Skew slab culverts, Box culverts, T-beam bridge, Pigeaud curves, Courbon's theory.

**UNIT III LONG SPAN BRIDGES**

9

Hollow girder bridges; Balanced cantilever bridges; Continuous girder bridges; Rigid frame bridges; Arch bridges; Bow string girder bridges; Pre-stressed concrete bridges - Composite pre-stressed concrete super structures, Erection of precast girders, Continuous construction, Recent trends

**UNIT IV BEARINGS AND SUBSTRUCTURE**

9

Design of bearings - slab, Girder, Skew bridges, Electrometric bearing; Design of Substructure - Piers, Abutments, Trestles; Joints - expansion joints; Type of foundations - Materials for substructures; Bridge inspection - Caissons, Cofferdams spread and pile foundation.

**UNIT V BRIDGE MAINTENANCE**

9

Bridge failures - Case studies; Maintenance of bridges - Detailed inspection, Routine inspection, Posting of bridges, Rating of existing bridges, Rebuilding of bridges, Load Testing of Bridges.

**TOTAL PERIODS 45****COURSE OUTCOMES**

Upon the completion of this course, the students will be able to

- familiar with the components of bridges, classification of bridges, importance of bridges
- proficient in Substructure of bridges.
- design Superstructure components of bridges.
- evaluate the types of bearings used in bridges.
- execute bridge maintenance and analyze case studies on bridges



## TEXT BOOKS

1. Krishna Raju.N, "Design of Bridges ", Oxford and IBH, 2009.
2. Ponnuswamy.S, "Bridge Engineering", Tata McGraw-Hill, 2008

## REFERENCES

1. Jagadeesh T.R. and Jayaram M.A., "Design of Bridge Structures", Prentice Hall of India Pvt Ltd., 2013
2. Johnson Victor.D, "Essentials of Bridge Engineering", Oxford and IBH, 2007.
3. IRC:6-2017 Standard Specifications and Code of Practice for Road Bridges, Section II – Load and Stresses (Fifth Revision).
4. IRC:24-2010 Standard Specifications and Code of Practice for Road Bridges, Steel Road Bridges (Limit State Method) (Third Revision).

## CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	2	2	2	-	-	2	2	2	2
CO2	3	3	2	2	-	2	2	2	-	-	2	2	2	2
CO3	3	3	2	2	-	2	2	2	-	-	2	2	2	2
CO4	3	3	2	2	-	2	2	2	-	-	2	2	2	2
CO5	3	3	2	2	-	2	2	2	-	-	2	2	2	2



**COURSE OBJECTIVES**

To enable the students to,

- understand the basic concepts on the limit state of serviceability
- impart knowledge to design the retaining walls.
- impart knowledge to design the water retaining structures.
- give an exposure on the design of flat slab and design the slab as per yield line analysis.
- provide in-depth knowledge to analyse and design the multi-storeyed structure under gravity and lateral loads.

**Prerequisite: Design of Reinforced Cement Concrete Structures and Structural Analysis II**

<b>UNIT I SERVICEABILITY LIMIT STATES: DEFLECTION AND CRACKING</b>	<b>9</b>
--	----------

Limit state of Deflection - factors affecting deflection, short and long term deflections, control of deflection, computation of deflection as per IS code; Limit state of Cracking - Reasons and effects of cracking, limiting criteria on cracking, Estimation of crack width.

<b>UNIT II RETAINING WALLS</b>	<b>9</b>
--------------------------------	----------

Types of Retaining walls - Design of cantilever and counterfort retaining walls

<b>UNIT III WATER TANKS</b>	<b>9</b>
-----------------------------	----------

Water Tank - Design of underground rectangular tank, Design of overhead circular and rectangular tanks; Domes for water tanks - Design of staging and foundations.

<b>UNIT IV FLAT SLABS AND YIELD LINE THEORY</b>	<b>9</b>
---	----------

Types of flat slabs - Direct design method, Equivalent frame method, Shear in flat slab, Design of flat slab; Introduction to yield line theory - Yield line patterns, Characteristic features of yield lines, Load on slabs; Yield line analysis by virtual work method to square, Rectangular, Circular and triangular slabs.

<b>UNIT V ANALYSIS OF BUILDING FRAMES</b>	<b>9</b>
---	----------

Analysis of multistorey framed structure - Method of substitute frames; Analysis for vertical loads; Analysis of frames subjected to horizontal forces - Portal method and Cantilever method.

**TOTAL PERIODS 45**

**COURSE OUTCOMES**

Upon the completion of this course, the students will be able to

- evaluate the deflection and crack width of RC members as per IS code provisions.
- classify and design the various types of retaining walls
- classify and design the water tanks as per standards.
- design flat slab as per standards and design approaches to design the slab by yield line theory.
- analyse the multistorey frames for vertical and horizontal loading using various methods.



## TEXTBOOKS

1. Krishna Raju, N., Advanced Reinforced Concrete Design., CBS Publishers and Distributors, New Delhi, 2016.
2. Varghese, P.C., Advanced Reinforced Concrete Design., PHI Learning Ltd., New Delhi, 2005.

## REFERENCES

1. Unikrishnana Pillai, S. and Devdasmenon, Reinforced Concrete Design. Tata McGraw-Hill Book Company, New Delhi, 2017.
2. Punmia, B.C., Limit State Design of Reinforced Concrete Structures., Laxmi Publications (P) Limited, New Delhi, 2007
3. Krishna Raju, N., "Design of RC Structures", CBS Publishers and Distributors, New Delhi, 2008.
4. Ram Chandra, "Limit State Design of Concrete Structure", Standard Book House, New Delhi, 2007.

## CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	2	2	2	-	-	2	2	2	2
CO2	3	3	2	2	-	2	2	2	-	-	2	2	2	2
CO3	3	3	2	2	-	2	2	2	-	-	2	2	2	2
CO4	3	3	2	2	-	2	2	2	-	-	2	2	2	2
CO5	3	3	2	2	-	2	2	2	-	-	2	2	2	2



## PROFESSIONAL ELECTIVE VI

CE20651

### CONSTRUCTION RESOURCE PLANNING AND MANAGEMENT

3 0 0 3

#### COURSE OBJECTIVES

To enable the students to,

- Impart the basic knowledge about resource planning.
- familiar with utilization of labour.
- analyse the concept of utilization of equipment and material.
- Provide knowledge on time management with related to cost
- study the resource levelling and allocation

**Prerequisite:** Nil

#### UNIT I RESOURCE PLANNING

9

Resource Planning - Procurement, Identification, Personnel, Planning for material, Labour, Time schedule and cost control, Types of resources, Manpower, Equipment, Material, Money, Time.

#### UNIT II LABOUR MANAGEMENT

9

Systems approach - Characteristics of resources, Utilization, measurement of actual resources required, Tools for measurement of resources, Labour, Classes of labour, Cost of labour, Labour schedule, Optimum use labour.

#### UNIT III MATERIALS AND EQUIPMENT

9

Material - Time of purchase, Quantity of material, sources, Transportation, Delivery and Distribution; Equipment - Planning and selecting by optimistic choice with respect to cost, Time, Source and handling.

#### UNIT IV TIME MANAGEMENT

9

Personnel time - Management and planning, Managing time on the project, Forecasting the future, Critical path measuring the changes and their effects; Cash flow and cost control.

#### UNIT V RESOURCE ALLOCATION AND LEVELLING

9

Time-cost trade off; Computer application - Resource leveling, Resource list, Resource allocation, Resource loading; Cumulative cost - Value Management.

**TOTAL PERIODS 45**

#### COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- gather the basic knowledge about time schedule and cost control
- identify the classes of labour and cost of labour.
- gain the knowledge about equipment and materials handling.
- perceive the concepts of time management with related to cost control.
- attain knowledge in the resource allocation and levelling.



## TEXTBOOKS

1. Andrew,D., Szilagg, "Hand Book of Engineering Management", 1982
2. Harvey, A., Levine, "Project Management using Micro Computers", Osborne -McGraw Hill C.A.Publishing Co., Inc. 1988. Industry, Granda Publishing Ltd., 1980.

## REFERENCES

1. James.A., Adrain, "Quantitative Methods in Construction Management", American Elsevier Publishing Co., Inc., 1973.
2. Oxley Rand Poslcit, "Management Techniques applied to the Construction"
3. Chitkara, K.K. "Construction Project Management: Planning, Scheduling and Control", Tata McGraw-Hill Publishing Company, New Delhi, 2009.
4. Seetharaman S "Construction Engineering and Management", Umesh Publications, New Delhi, 2015.

## CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	2	-	2	2	2	-	-	-	2	2	2
CO2	3	-	-	2	-	2	2	2	-	-	-	2	2	2
CO3	3	-	-	2	-	2	2	2	-	-	-	2	2	2
CO4	3	-	-	2	-	2	2	2	-	-	-	2	2	2
CO5	3	-	-	2	-	2	2	2	-	-	-	2	2	2



**STRUCTURES****COURSE OBJECTIVES**

To enable the students to,

- study the maintenance and repair strategies.
- identify an overview of quality assurance for concrete construction and explain the serviceability and durability properties of concrete under various exposure conditions.
- explain the repair materials and techniques used in the Construction Industry.
- identify the repair, rehabilitation and retrofitting techniques to overcome the structural damage due to various exposure conditions.
- explain the demolition techniques of broken-down structures

**Prerequisite:** Nil

**UNIT I MAINTENANCE AND REPAIR STRATEGIES****9**

Maintenance, repair and rehabilitation - Facets of maintenance, Importance of maintenance; Various aspects of inspection - Preventive measures; Assessment procedure for evaluating a damaged structure; Causes of deterioration - Concrete, Steel, Masonry and timber structures, Surface deterioration; Efflorescence - Causes, Prevention and protection.

**UNIT II STRENGTH AND DURABILITY OF CONCRETE****9**

Quality assurance for concrete - Need, Components, Conceptual bases for quality assurance schemes; Properties of concrete - Strength, Durability and Thermal properties; Fire resistance; Permeability of concrete; Cracks - Different types, Causes; Effects due to climate, Temperature, Sustained elevated temperature; Corrosion; Effects of cover thickness and cracking.

**UNIT III SPECIAL CONCRETE****9**

Polymer concrete; Sulphur infiltrated concrete; Ferro-cement; Fibre reinforced concrete; High strength concrete; High performance concrete; Expansive cement; Foamed concrete; Vacuum concrete; Self compacting concrete; Geopolymer concrete; Reactive powder concrete - Concrete made with industrial wastes.

**UNIT IV TECHNIQUES FOR REPAIR AND PROTECTION METHODS****9**

Non-destructive Testing Techniques; Epoxy injection; Shoring; Underpinning; Corrosion protection Techniques - Corrosion inhibitors, Corrosion resistant steels, Rust eliminators, Coatings to reinforcement, Cathodic protection.

**UNIT V REPAIR, REHABILITATION AND RETROFITTING OF STRUCTURES****9**

Strengthening of structural elements; Repair of structures distressed due to corrosion - fire, leakage, and earthquake; Demolition techniques - Engineered demolition methods and Case studies.

**TOTAL PERIODS 45**



## COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- apply knowledge about the quality of concrete.
- attain knowledge about the durability aspects of concrete.
- perceive the causes of deterioration of concrete structures.
- evaluate the assessment of distressed structures.
- attain knowledge about repairing of structures and demolition procedures.

## TEXTBOOKS

1. P.C.Varghese, Maintenance Repair and Rehabilitation and Minor works of building, Prentice Hall India Pvt Ltd 2014.
2. B.Vidivelli, Rehabilitation of Concrete Structures Standard Publishes Distribution 1<sup>st</sup> edition 2009

## REFERENCES

1. Shetty.M.S. Jain A K., Concrete Technology - Theory and Practice, S.Chand and Company, Eighth Edition, 2019.
2. Hand book on Seismic Retrofit of Buildings, A. Chakrabartiet.al., Narosa Publishing House, 2010
3. R. Dodge Woodson, Concrete Structures, Protection, Repair and Rehabilitation, Butterworth-Heinemann, Elsevier, New Delhi 2012.
4. Hand Book on "Repair and Rehabilitation of RCC Buildings" – Director General works CPWD , Govt of India New Delhi – 2002

## CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	2	-	2	2	-	1	-	2	2	2	1
CO2	2	2	-	2	-	2	2	-	1	-	2	2	2	1
CO3	2	2	-	2	-	2	2	-	1	-	2	2	2	1
CO4	2	2	-	2	-	2	2	-	1	-	2	2	2	1
CO5	2	2	-	2	-	2	2	-	1	-	2	2	2	1



**COURSE OBJECTIVES**

To enable the students to,

- design and analyse the various methodologies of tall structures
- perform stability analysis of tall structures.
- impose the knowledge on the performance of structure under different loading conditions
- know the concepts behind the analysis and design of buildings
- study about different stability considerations

**Prerequisite:** Nil

**UNIT I DESIGN CRITERIA AND MATERIALS**

9

Design Philosophy - Modern concepts; Materials used, High Performance Concrete, Fibre Reinforced Concrete, Light weight concrete, Self-compacting concrete, High strength steel, Composites.

**UNIT II LOADING**

9

Gravity Loading - Dead load, Live load, Live load reduction techniques, Impact load, Construction load, Sequential loading; Wind Loading - Static and dynamic approach, Analytical method, Wind tunnel experimental methods; Earthquake Loading - Equivalent lateral load analysis, Dynamic analysis, Combination of Loads.

**UNIT III BEHAVIOUR OF VARIOUS STRUCTURAL SYSTEMS**

9

Introduction - Factors affecting the growth, height and structural form, Behaviour of braced frames, Rigid frames, infilled frames, Shear walls, Coupled shear walls; Wall - Frames, Tubular and outrigger - Hybrid systems.

**UNIT IV ANALYSIS**

9

Modeling for approximate analysis - accurate analysis and reduction techniques, Analysis of structures as an integral unit, Analysis for drift and twist; Computerized 3D analysis.

**UNIT V DESIGN PARAMETERS**

9

Design for differential movement - Creep and shrinkage effects, Temperature effects and fire resistance; Stability of tall structures -  $P\Delta$  Effects, Buckling analysis of tall buildings.

**TOTAL PERIODS 45****COURSE OUTCOMES**

Upon the completion of this course, the students will be able to

- explain the design aspects and the various innovative materials
- apply the knowledge of engineering fundamentals to characterize various types of loading considered for the analysis of tall building.
- identify various structural systems, their behavior and performance under different loading conditions.
- analyze the structures as an integral unit for drift and twist
- design tall structures under different stability considerations



## TEXTBOOKS

1. Bryan Stafford Smith and Alex Coull, Tall Building Structures, Analysis and Design, John Wiley and Sons, Inc., 2011.
2. Taranath B.S, Structural Analysis and Design of Tall Buildings: Steel and Composite Construction, McGraw Hill, 2011.

## REFERENCES

1. Lin.T.Y, StotesBurry.D, "Structural Concepts and systems for Architects and Engineers" John Wiley, 2008
2. Lynn S.Beedle, "Advances in Tall Buildings", CBS Publishers and Distributors, Delhi, 2006.
3. Wolfgang Schueller, "High Rise Building Structures", John Wiley and Sons, New York 1997
4. Coull. A. and Smith, Stafford, B. " Tall Buildings ", Pergamon Press, London, 1997.

## CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	1	2	2	2	-	-	-	2	3	2
CO2	3	2	2	2	1	2	2	2	-	-	-	2	3	2
CO3	3	2	2	2	1	2	2	2	-	-	-	2	3	2
CO4	3	2	2	2	1	2	2	2	-	-	-	2	3	2
CO5	3	2	2	2	1	2	2	2	-	-	-	2	3	2



**COURSE OBJECTIVES**

To enable the students to,

- assess the causes of pollution in the soil.
- acquire knowledge on the current practices of waste disposal.
- know about various disposal system for a particular waste.
- get knowledge on utilization of solid waste for soil improvement.
- use the suitable remediation methods based on contamination.

**Prerequisite: Nil**

**UNIT I GENERATION OF WASTES AND CONSEQUENCES OF SOIL POLLUTION 9**

Introduction to Geo environmental engineering - Environmental cycle, Sources, production, classification of waste, causes of soil pollution, Factors governing soil pollution interaction clay minerals - Failures of foundation due to waste movement.

**UNIT II SITE SELECTION AND SAFE DISPOSAL OF WASTE 9**

Safe disposal of waste - Site selection for landfills, Characterization of land fill sites and waste, Risk assessment, Stability of landfills, Current practice of waste disposal; Monitoring facilities - Passive containment system, Application of geosynthetics in solid waste management, Rigid or flexible liners.

**UNIT III TRANSPORT OF CONTAMINANTS 9**

Contaminant transport in sub surface - Advection, Diffusion, Dispersion; Governing equations -Contaminant transformation, Sorption, Biodegradation - Ion exchange, Precipitation, Hydrological consideration in land fill design, Ground water pollution.

**UNIT IV WASTE STABILIZATION 9**

Stabilization - Solidification of wastes, Micro and macro encapsulation, Absorption, Adsorption, Precipitation, Detoxification, Mechanism of stabilization, Organic and inorganic stabilization, Utilization of solid waste for soil improvement, case studies.

**UNIT V REMEDIATION OF CONTAMINATED SOILS 9**

Exsitu and insitu remediation - Solidification, bio-remediation, incineration, soil washing, phytoremediation, soil heating, vetrification, bio-venting.

**TOTAL PERIODS 45**

**COURSE OUTCOMES**

Upon the completion of this course, the students will be able to

- assess the contamination in the soil
- understand the current practice of waste disposal
- prepare the suitable disposal system for a particular waste.
- stabilize the waste and utilization of solid waste for soil improvement.
- select suitable remediation methods based on contamination.



## TEXTBOOKS

1. Daniel B.E., "Geotechnical Practice for waste disposal", Chapman and Hall, London 1993.
2. Manoj Datta," Waste Disposal in Engineered landfills", Narosa Publishing House, 1997.

## REFERENCES

1. Westlake, K, "Landfill Waste pollution and Control", Albion Publishing Ltd., England, 1995.
2. Ott, W.R., "Environmental indices, Theory and Practice", Ann Arbor, 1978.
3. Fried, J.J., "Ground Water Pollution", Elsevier, 1975.
4. ASTM Special Tech. Publication 874, Hydraulic Barrier in Soil and Rock, 1985.

## CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3-strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	1	2	3	-	-	-	1	2	1	2
CO2	3	2	2	2	1	2	3	-	-	-	1	2	1	2
CO3	3	2	2	2	1	2	3	-	-	-	1	2	1	2
CO4	3	2	2	2	1	2	3	-	-	-	1	2	1	2
CO5	3	2	2	2	1	2	3	-	-	-	1	2	1	2



## LIST OF OPEN ELECTIVES

### OPEN ELECTIVE II

**CE20903**                      **CONTRACT LAWS AND REGULATIONS**                      **3 0 0 3**

#### **COURSE OBJECTIVES**

To enable the students to,

- study various elements in the contract document
- review different concepts of tender making process as per contract law.
- get an information on arbitration procedure during disputes.
- study the various taxes related to construction business and statutory recommendations.
- know the complexity of labour laws along with legislation in the construction industries.

**Prerequisite: Nil**

#### **UNIT I      CONSTRUCTION CONTRACTS**                      **9**

Indian Contract Act - Need, Provisions, Scope for modifications / improvement; Contract specifications - Types of contract documents used for construction, Contract procurement, Selecting a contractor; Introduction to BOT and BOOT projects; EPC contracts.

#### **UNIT II      TENDERS**                      **9**

Prequalification - Bidding, Accepting, Evaluation of tender from technical, Contractual and commercial points of view, Contract formation and interpretation, Preparation of tender schedules; Potential contractual problems; World bank procedures and guidelines; Tamil Nadu transparency in tenders act 1998 rules 2000.

#### **UNIT III      ARBITRATION**                      **9**

Arbitration and litigation procedure - Preparation, Settlement, Evidence; Comparison of actions and laws; Agreements - Subject matter, Violations; Appointment of arbitrators - Conditions of arbitration, Powers and duties of arbitrator, Enforcement of award, Costs, Arbitration and conciliation act 1996 - Case studies.

#### **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 REGULATIONS**                      **9**

Social security - Welfare legislation, Laws relating to wages, Bonus and industrial disputes, Labour administration; Insurance and safety regulations; Workmen's compensation act; Indian factory act 1948; Tamil Nadu factory act 1950; Child labour act 1986 amended in 2016 - Other labour laws.

**TOTAL PERIODS      45**



## COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- prepare contract document for various government and non-governmental works.
- make tender as per the current rates along with guidelines from sources
- perceive the factors of arbitration during the time of court proceedings
- exercise correctly the procedure during sell; buy their land and property oriented with various tax provisions.
- adopt and follow the various acts and laws related to labour in the field.

## TEXTBOOKS

1. Jimmie Hinze, "Construction Contracts", McGraw Hill, New Delhi 2013
2. Gajaria G.T., "Laws Relating to Building and Engineering Contracts in India", M.M. Tripathi Private Ltd., Bombay, 2000.

## REFERENCES

1. Patil. B.S, "Civil Engineering Contracts and Estimates", Universities Press (India) Private Limited, 2015.
2. Joseph T. Bockrath, "Contracts and the Legal Environment for Engineers and Architects", McGraw Hill, 2010.
3. Oxley Rand Posicit, "Management Techniques applied to the Construction Industry", Grand Publications, Noida, 2009
4. Tamilnadu PWD Code, 2005

## CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	-	2	2	-	-	-	2	2	1	2
CO2	3	2	2	2	-	2	2	-	-	-	2	2	1	2
CO3	3	2	2	2	-	2	2	-	-	-	2	2	1	2
CO4	3	2	2	2	-	2	2	-	-	-	2	2	1	2
CO5	3	2	2	2	-	2	2	-	-	-	2	2	1	2



**COURSE OBJECTIVES**

To enable the students to,

- provide students an exposure to disasters, their significance and types
- ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- gain a preliminary understanding of approaches of disaster risk reduction
- enhance awareness of institutional processes in the country
- develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

**Prerequisite:** Nil

**UNIT I INTRODUCTION TO DISASTERS**

9

Disaster - Definition, Hazard, Vulnerability, Resilience, Risks; Types of disasters - Natural Disasters: Earthquake, Landslide, Flood, Drought, Cyclones, Tsunami and Forest Fire; Man-made disaster - War and civil strife, Epidemics, Chemical and industrial accidents; Do's and Don'ts during disaster; Global trends in disasters - Urban disasters, Complex emergencies, Climate change.

**UNIT II PRE AND POST DISASTER RISK REDUCTION STRATEGIES**

9

Disaster management cycle - Phases of disaster, Disaster mapping, Predictability, Forecasting and warning, Disaster preparedness plan; Land use zoning for disaster management; Preparing community through IEC; Disaster mitigation - Disaster relief, Search, Rescue and Evacuation, Shelter for Victims; Livestock and relief measures; Clearance of debris and disposal of the dead; Control of situation - Damage assessment; Rehabilitation - Social and economic aspects, Reconstruction and rehabilitation as means of development.

**UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT**

9

Factors affecting vulnerabilities; Differential impacts - Impact of development projects such as dams, embankments, changes in Land-use; Climate change adaptation; IPCC scenario and scenarios in the context of India.

**UNIT IV DISASTER MANAGEMENT IN INDIA**

9

Disaster management act 2005; Hazard and vulnerability profile of India; Roles and responsibilities of police and armed forces - Panchayat Raj Institutions/Urban Local Bodies (PRIs/ULBs), NGO's, State and central government; Disasters of India and lesson learnt from it.

**UNIT V APPLICATIONS OF SCIENCE AND TECHNOLOGY FOR DISASTER MANAGEMENT**

9

Role of GIS; Remote Sensing and Information Technology for disaster management; Early warning system and its dissemination; Land use planning and development regulations; Disaster safe designs and constructions -Structural and non-structural mitigation of disasters; Institutions for disaster management in India.

**TOTAL PERIODS 45**



## COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- differentiate the types of disasters, causes and their impact on environment and society
- assess vulnerability and various methods of risk reduction measures as well as mitigation
- draw the hazard and vulnerability profile of India and Scenarios in the Indian context
- retrieve disaster damage assessment and management.
- gain the skills on disaster management case studies and field works

## TEXTBOOKS

1. A.K Gupta, Sreeja S. Nair, Sandhya Chatterji. "Disaster Management and Risk Reduction", Narosa Public House, 2013.
2. Singhal J.P. "Disaster Management", Laxmi Publications, 2010.

## REFERENCES

1. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012
2. Kapur Anu "Vulnerable India: A Geographical Study of Disasters", IAS and Sage Publishers, New Delhi, 2010.
3. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005
4. Government of India, National Disaster Management Policy, 2009.

## CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	-	2	2	3	2	2	-	1	2	2	-
CO2	2	2	-	-	2	2	3	2	2	-	1	2	2	-
CO3	2	2	-	-	2	2	3	2	2	-	1	2	2	-
CO4	2	2	-	-	2	2	3	2	2	-	1	2	2	-
CO5	2	2	-	-	2	2	3	2	2	-	1	2	2	-

