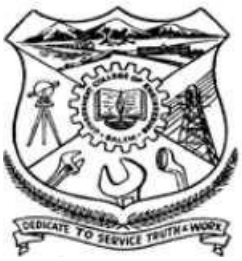

GOVERNMENT COLLEGE OF ENGINEERING
SALEM – 636 011

(An Autonomous Institution affiliated to Anna University- Chennai)

Regulations 2022 - Autonomous Courses(For Students Admitted from 2022 – 2023)

DEPARTMENT OF CIVIL ENGINEERING

CURRICULUM & SYLLABUS
(Choice based credit system)

B.E. CIVIL ENGINEERING (P.T)

GOVERNMENT COLLEGE OF ENGINEERING SALEM – 636011
(An Autonomous Institution, Affiliated to Anna University, Chennai)
Regulations 2022
Autonomous Courses(For Students Admitted from 2022-2023)

B.E. CIVIL ENGINEERING – PART TIME

SEMESTER I

Sl. No	Course code	Name of the Course	Hours/week					Maximum Marks		
			Category	Lecture	Tutorial/ Demo*	Practical	Credits	CA	FE	Total
THEORY										
1.	22PTMA101	Mathematics – I	BS	3	0	0	3	40	60	100
2.	22PTCS101	Fundamentals of Problem Solving and C- Programming	BS	3	0	0	3	40	60	100
3.	22PTCE101	Mechanics of Solids	BS	3	0	0	3	40	60	100
4.	22PTCE102	Mechanics of Fluids	ES	3	0	0	3	40	60	100
5.	22PTCE103	Concrete Technology	ES	3	0	0	3	40	60	100
		TOTAL		**15**	**15**	**0**	**15**	**200**	**300**	**500**
	SEMESTER - II									
6.	22PTMA201	Mathematics - II	BS	3	0	0	3	40	60	100
7.	22PTCY201	Environmental Science & Engineering	BS	3	0	0	3	40	60	100
8.	22PTCE201	Basic Structural Steel Design	PC	3	0	0	3	40	60	100
9.	22PTCE202	Strength of Materials	PC	3	0	0	3	40	60	100
10.	22PTCE203	Highway and Railway Engineering	PC	3	0	0	3	40	60	100
		TOTAL		**15**	**0**	**0**	**15**	**200**	**300**	**500**
SEMESTER - III										
THEORY										
Sl. No	**Course code**	**Name of the Course**	**Hours/week**					**Maximum Marks**		
			Category	**Lecture**	**Tutorial/ Demo***	**Practical**	**Credits**	**CA**	**FE**	**Total**
1.	22PTMA301	Numerical Methods	HS	3	0	0	3	40	60	100
2.	22PTCE301	Construction Technology and	PC	3	0	0	3	40	60	100

		Equipments								
3.	22PTCE302	Surveying	PC	3	0	0	3	40	60	100
4.	22PTCE303	Design of Reinforced Concrete Elements	PC	3	0	0	3	40	60	100
5.	22PTCE304	Structural Analysis - I	ES	3	0	0	3	40	60	100
		TOTAL	HS	**15**	**0**	**0**	**15**	**200**	**300**	**500**
SEMESTER - IV										
6.	22PTCE401	Environmental Engineering - I	ES	3	0	0	3	40	60	100
7.	22PTCE402	Mechanics of Soils	PC	3	0	0	3	40	60	100
8.	22PTCE403	Structural Analysis - II	PC	3	0	0	3	40	60	100
9.	22PTCE404	Design of Steel Structures	PC	3	0	0	3	40	60	100
10.	22PTCEXX	Professional Elective - I	PE	3	0	0	3	40	60	100
		TOTAL		**15**	**0**	**0**	**15**	**200**	**300**	**500**
SEMESTER - V										
THEORY										
Sl. No	**Course code**	**Name of the Course**	**Hours/week**					**Maximum Marks**		
			Category	**Lecture**	**Tutorial/ Demo***	**Practical**	**Credits**	**CA**	**FE**	**Total**
1.	22PTCE501	Applied Hydraulic Engineering	BS	3	0	0	3	40	60	100
2.	22PTCE502	Foundation Engineering	PC	3	0	0	3	40	60	100
3.	22PTCE503	Design of Reinforced Concrete and Masonry Structures	PC	3	0	0	3	40	60	100
4.	22PTCE504	Estimation, Quantity Surveying and Valuation	PC	3	0	0	3	40	60	100
5.	22PTCEXX	Professional Elective - II	PE	3	0	0	3	40	60	100
		TOTAL		15	0	0	15	**200**	**300**	500

SEMESTER VI											
THEORY											
Sl.No	**Course code**	**Name of the Course**	**Hours/week**					**Maximum Marks**		
			Category	**Lecture**	**Tutorial/ Demo***	**Practical**	**Credits**	**CA**	**FE**	**Total**
1.	22PTCE601	Environmental Engineering - II	PC	3	0	0	3	40	60	100
2.	22PTCE602	Water Resources Engineering	PC	3	0	0	3	40	60	100
3.	22PTCEXX	Professional Elective - III	PC	3	0	0	3	40	60	100
4.	22PTCEXX	Professional Elective - IV	PC	3	0	0	3	40	60	100
5.	22PTCE603	Design and Drawing (Concrete and Steel)	PC	0	0	3	2	40	60	100
		TOTAL		12	0	0	14	**220**	**280**	500

SEMESTER VII										
THEORY										
Sl.No	**Course code**	**Name of the Course**	**Hours/week**					**Maximum Marks**		
			Category	**Lecture**	**Tutorial/ Demo***	**Practical**	**Credits**	**CA**	**FE**	**Total**
1.	22PTCE801	Economics and Management	PC	3	0	0	3	40	60	100
2.	22PTCEXX	Professional Elective - V	PC	3	0	0	3	40	60	100
3.	22PTCEXX	Professional Elective - VI	PC	3	0	0	3	40	60	100
PRACTICAL										
4.	22PTCE802	Project Work	EEC	0	0	9	6	120	80	200
		TOTAL		9	0	9	15	240	260	500

Total Number of credits to be earned for the award of degree = 104

Professional Electives (PE)

SEMESTER - V, VI & VII											
THEORY											
Sl. No	Course Code	Name of the Course	Hours/week					Maximum Marks		
			Category	Lecture	Tutorial/ Demo*	Practical	Credits	CA	FE	Total
1.	22PTCEE01	Irrigation Engineering	PE	3	0	0	3	40	60	100
2.	22PTCEE02	Water Shed Management	PE	3	0	0	3	40	60	100
3.	22PTCEE03	Ground Water Engineering	PE	3	0	0	3	40	60	100
4.	22PTCEE04	Hydrology	PE	3	0	0	3	40	60	100
5.	22PTCEE05	Coastal Engineering	PE	3	0	0	3	40	60	100
6.	22PTCEE06	Ground Improvement Techniques	PE	3	0	0	3	40	60	100
7.	22PTCEE07	Introduction to Soil Dynamics and Machine Foundation	PE	3	0	0	3	40	60	100
8.	22PTCEE08	Soil Structure Interaction	PE	3	0	0	3	40	60	100
9.	22PTCEE09	Reinforced Soil Structures	PE	3	0	0	3	40	60	100
10.	22PTCEE10	Subsurface Investigation and Instrumentation	PE	3	0	0	3	40	60	100
11.	22PTCEE11	Advanced Surveying Techniques	PE	3	0	0	3	40	60	100
12.	22PTCEE12	Traffic Engineering	PE	3	0	0	3	40	60	100
13.	22PTCEE13	Airports, Docks and Harbours Engineering	PE	3	0	0	3	40	60	100
14.	22PTCEE14	Design of Bridges	PE	3	0	0	3	40	60	100
15.	22PTCEE15	Integrated Traffic Planning and Management	PE	3	0	0	3	40	60	100
16.	22PTCEE16	Construction Techniques and Equipments	PE	3	0	0	3	40	60	100
17.	22PTCEE17	Fundamentals of Remote Sensing and GIS	PE	3	0	0	3	40	60	100
18.	22PTCEE18	Construction and Project Management	PE	3	0	0	3	40	60	100
19.	22PTCEE19	Project Safety Management	PE	3	0	0	3	40	60	100
20.	22PTCEE20	Repair and Rehabilitation of Structures	PE	3	0	0	3	40	60	100
21.	22PTCEE21	Constructional Personnel Management	PE	3	0	0	3	40	60	100

22.	22PTCEE22	Industrial Waste Management	PE	3	0	0	3	40	60	100
23.	22PTCEE23	Hazardous Waste Management	PE	3	0	0	3	40	60	100
24.	22PTCEE24	Air Pollution Monitoring and Control	PE	3	0	0	3	40	60	100
25.	22PTCEE25	Municipal Solid Waste Management	PE	3	0	0	3	40	60	100
26.	22PTCEE26	Marine Pollution Monitoring and Control	PE	3	0	0	3	40	60	100
27.	22PTCEE27	Environmental Impact Assessment	PE	3	0	0	3	40	60	100
28.	22PTCEE28	Coastal Zone Management	PE	3	0	0	3	40	60	100
29.	22PTCEE29	Advanced Structural Analysis	PE	3	0	0	3	40	60	100
30.	22PTCEE30	Storage Structures	PE	3	0	0	3	40	60	100
31.	22PTCEE31	Pre stressed Concrete Structures	PE	3	0	0	3	40	60	100
32.	22PTCEE32	Advanced Steel Structures	PE	3	0	0	3	40	60	100
33.	22PTCEE33	Computer Aided Design of Structures	PE	3	0	0	3	40	60	100
34.	22PTCEE34	Tall Buildings	PE	3	0	0	3	40	60	100
35.	22PTCEE35	Smart Materials and Smart Structures	PE	3	0	0	3	40	60	100
36.	22PTCEE36	Prefabricated Structures	PE	3	0	0	3	40	60	100
37.	22PTCEE37	Wind Engineering	PE	3	0	0	3	40	60	100
38.	22PTCEE38	Design of Composite Structures	PE	3	0	0	3	40	60	100
39.	22PTCEE39	Coastal Structures	PE	3	0	0	3	40	60	100
40.	22PTCEE40	Dynamics and Earthquake Resistant Design of Structures	PE	3	0	0	3	40	60	100
41.	22PTCEE41	Industrial Structures	PE	3	0	0	3	40	60	100
42.	22PTCEE42	Ferro Cement Technology	PE	3	0	0	3	40	60	100
43.	22PTCEE43	Finite Elements Analysis	PE	3	0	0	3	40	60	100
44.	22PTCEE44	Experimental Techniques and Instrumentation	PE	3	0	0	3	40	60	100

22PTMA101 MATHEMATICS - I L T P C :3 0 0 3

(Common to all branches of Engineering)

COURSE OBJECTIVES:

- To make the Student acquire sound knowledge of techniques in solving ordinary and partial differential equations that model engineering problems
- To acquaint the Student with the concepts of vector calculus, needed for solving engineering problems
- Application areas such as heat conduction, elasticity, fluid/aero dynamics and flow of electric current are exploded through complex variables theory and integration.

UNIT I ORDINARY DIFFERENTIAL EQUATIONS 9

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT II PARTIAL DIFFERENTIAL EQUATIONS 9

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients.

UNIT III VECTOR CALCULAS 9

Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Statement of Green's theorem in a plane, Gauss divergence theorem and Stokes theorem – Simple applications involving cubes and rectangular parallelopipeds.

UNIT IV ANALYTIC FUNCTIONS 9

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy – Riemann equation and sufficient conditions (excluding proofs) – Properties of analytic function – Harmonic conjugate – construction of analytic functions – Conformal mapping: w= z+c, cz, 1/z and bilinear transformation.

UNIT V COMPLEX INTEGRATION 9

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor and Laurent expansions – Singular points – residues – Residue theorem – Application of residue theorem to evaluate real integrals over unit circle and semi-circular contours (excluding poles on boundaries).

TOTAL PERIODS = 45

COURSE OUTCOMES:

On completion of the course, the Students will have

1. Learnt the techniques of solving ordinary and partial differential equations that arise in engineering problems
2. Familiarity with the concept of vector calculus and vector integration.
3. Acquired the knowledge of Complex variables and its applications.

TEXT BOOKS:

1. Grewal. B.S, "Higher Engineering Mathematics", 43rd Edition, Khanna publications, Delhi, 2014.
2. P. Kandasamy, K. Thilagavathy and K. Gunavathy, Engineering Mathematics (For I year B.E., B.Tech), Ninth Edition, S. Chand & Co. Ltd. New Delhi, 2010.

REFERENCES:

1. James Stewart, "Calculus with Early Transcendental Functions", Cengage Learning, New Delhi, (2008).
2. Veerarajan T. Engineering mathematics (For semester I and II), 5th Edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2009.
3. Erwin Kreyszig, "Advanced Engineering mathematics", 7th Edition, Wiley India, 2007.
4. Jain R.K. and Iyengar S.R.K, "Advanced Engineering mathematics", 3rd Edition, Narosa Publishing House Pvt. Ltd., 2007.

22PTCS101 Fundamentals of Problem Solving and C- Programming **L T P C: 3 0 0 3**

(Common to all branches of Engineering)

COURSE OBJECTIVES

- To introduce the problem solving methodologies.
- To learn the basic concepts of developing an algorithm and pseudo code
- To understand the concepts of C Programming.

UNIT I INTRODUCTION TO PROBLEM SOLVING 9

Problem formulation, Problem Solving methods, Need for logical analysis and thinking – Algorithm – Pseudo code – Flow Chart. Need for computer languages– Number System – Binary – Decimal – Conversion – Problems.

UNIT II C PROGRAMMING BASICS 9

C Character set, Identifies and Keywords, Data Types, Declarations, Expressions, Statements and Symbolic constants, Operators – Arithmetic Operators – Unary operators – Relational and Logical Operators – Assignment operators – Conditional operators. Managing Input and Output operations, pre-processor directives and storage classes.

UNIT III CONTROL STATEMENTS, ARRAYS AND STRINGS 9

Conditional statements-branching and looping statements. Arrays – Initialization – Declaration – one dimensional and two dimensional arrays. Strings - String operations – String handling functions.

UNIT IV FUNCTIONS AND POINTERS 9

Function – Library functions and user-defined functions – Function prototypes and function definitions – Call by value –Call by reference – Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays

UNIT V STRUCTURES, UNIONS AND FILE 9

Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure – Passing structures to functions – Array of structures – Pointers to structures-Union-basic file operation.

TOTALPERIODS: 45

COURSE OUTCOMES

After completion of this course, the students would be able to

- To Understand the basic terminology used in computer programming
- To write, compile and debug programs in C language.
- To Use different data types in a computer program.
- To Understand, analyze and implement software development tools like algorithm, pseudo codes and programming structure
- To write programs related to simple/ moderate mathematical and logical problems in 'C'.

TEXT BOOKS

1. Anita Goel and Ajay Mittal, 'Computer Fundamentals and Programming in C', Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
2. E Balagurusamy, 'Programming in ANSI C', fourth Edition, Tata McGraw-Hill, 2008.

REFERENCE BOOKS

1. Byron S Gottfried, 'Programming with C', Schaum's Outlines, Second Edition, Tata McGraw-Hill, 2006.
2. Kernighan,B.W and Ritchie,D.M, 'The C Programming language', Second Edition, Pearson Education, 2006.
3. Yashavant P. Kanetkar. 'Let Us C ',BPB Publications, 2011

22PTCE101 MECHANICS OF SOLIDS 3 0 0 3

OBJECTIVE

- To understand the behaviour and mechanical properties of solids.
- To understand the behaviour of solid members under various forces.

UNIT - I: STRESS STRAIN AND DEFORMATION OF SOLIDS 9

Stress and strain due to axial force – Elastic limit – Hooke's law – Factor of safety –Lateral strain – Poisson's ratio – Volumetric strain – changes in dimensions and volume– shear stress – shear strain – Relationship between elastic constants. Stepped bars - uniformly varying sections – composite bar – stresses due to temperature.Hoop and Longitudinal stresses in thin cylindrical and spherical shells under internal pressure – changes in dimensions and volume. Strain Energy due to axial force – proof resilience and modulus of resilience – stresses due to gradual load, sudden load and impact load.

UNIT – II: SHEAR FORCE AND BENDING MOMENT DIAGRAMS 9

Relationship between load, shear force and bending moment – shear force and bending moment diagrams for cantilever, simply supported and overhanging beams under concentrated loads, uniformly distributed loads, uniformly varying loads and concentrated moment - Maximum bending moment and point of contra flexure.

UNIT – III: STRESSES DUE TO BENDING AND SHEAR 9

Theory of simple bending and assumptions –Analysis of beams for stresses-Stress distribution at a cross due to bending moment and shear force for cantilever,simply supported and overhanging beams with different loading conditions – Strain Energy due to bending moment and shear.

UNIT – IV: TORSION 9

Theory of torsion and assumptions – Derivation of torsion formula - Polar modulus – stresses in solid and hollow circular shafts – Power transmitted by a shaft – Strain energy due to torsion - Close coiled helical spring subjected to an axial load.

UNIT – V: COMPLEX STRESSES (Two dimensional only) 9

State of stress at a point – Normal and tangential stresses and their planes – Principal stress and their planes – Plane of maximum shear stress – Analytical method. Principal strains and strain energy due to principal stresses.

PLANE TRUSSES: Analysis of plane trusses – Method of joints – Method of sections.

TOTAL:45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Thorough understanding of the fundamental concepts of stress and strain in mechanics of solids and structures.
- the ability to analyse determinate beams and trusses to determine shear forces, bending moments and axial forces.
- a sufficient knowledge in designing shafts to transmit required power and also springs for its maximum energy storage capacities.

TEXT BOOKS:

1. Bansal R.K Strength *of Materials* Laxmi Publications (P) Ltd, New Delhi,2001
2. Bhavikatti S.S *Strength of Materials*, Vikas Publishing House (P) Ltd, New Delhi, Second Edition,2002
3. Rajput R.K., *Strength of Materials*, S.Chand & Company Ltd., New Delhi.2007

REFERENCES:

1. Egor P Popov. *Engineering Mechanics of Solids*, Prentice Hall of India, New Delhi, 2003
2. Vazirani V. N. Ratwani M.M. *Analysis of Structures, Volume* – 1, Khanna Publishers, New Delhi, 1998
3. William Nash. *Theory and Problems of Strength of Materials*, Schaum's Outline Series, McGraw-Hill International Edition.
4. Srinath L.N. *Advanced Mechanics of Solids*, Tata McGraw-Hill Publishing Co., New Delhi, 2003.
5. Kazimi S.M.A. *Solid Mechanics*, Tata McGraw-Hill Publishing Co, New Delhi, 2003.
6. Punmia B.C Jain A.K and Jain A.K . *Strength of Materials and Theory of Structures*, Vols. I & II, XI Edition, Laxmi Publications (P) Ltd, New Delhi,2002
7. Ramamurtham S. and Narayanan R. *Strength of Materials* , Dhanpat Rai Publishing Company (P) Ltd., Reprint 2011.

22PTCE102 MECHANICS OF FLUIDS 3 0 0 3

OBJECTIVE

The student is introduced to the definition and properties of fluid. Principles of fluid statics, kinematics and dynamics are dealt with subsequently. The applications of similitude and model study are covered. After undergoing this course, the student would have learnt fluid properties and application of fluid flow in real situations.

UNIT – I: FLUID PROPERTIES 9

Definitions – Fluid and fluid mechanics – Dimensions and units – Fluid properties – density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapour pressure, capillarity and surface tension.
Pressure – Pascal's law - Relationship between pressures – pressure measurements by manometers.

UNIT – II: FLUID STATICS & KINEMATICS 9

Fluid Statics: Hydrostatic forces on plane and curved surfaces – Total pressure and centre of pressure – equilibrium of floating and submerged bodies - Meta centre – metacentric height.
Fluid Kinematics: Flow visualization – types of flow – lines of flow - velocity and acceleration - Continuity equation (one, two and three dimensional forms) – Stream function – velocity potential function – flow nets – Measurement of Velocity

UNIT – III: FLUID DYNAMICS 9

Equations of motion – Euler's equation of motion along a streamline - Bernoulli's equation – applications – Venturi meter, Orifice meter, Pitot tube.
Laminar flow – viscous flow through pipes and between parallel plates – Hagen-Poiseuille equation. Turbulent flow – Darcy-Weisbach formula – Moody diagram

UNIT – IV: FLOW THROUGH PIPES AND BOUNDARY LAYER 9

Major and minor losses of flow in pipes – Hydraulic Gradient Line – Total Energy Line - Pipes in series and in parallel – power transmission through pipes.
Definition of boundary layer – Thickness and classification – separation of boundary layer – methods of preventing the separation.

UNIT –V: DIMENSIONAL AND MODEL ANALYSIS 9
Dimensional Analysis – Rayleigh's method, Buckingham's Pi-Theorem. Model analysis – types of similitude – dimensionless numbers – Model Laws – classification of Models - Scale effect.

TOTAL: 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Understand the fundamentals of Fluid Mechanics
- Determine the properties of fluid and pressure and their measurement
- Compute forces on immersed plane and curved plates
- Apply continuity equation and energy equation in solving problems on flow through conduits
- Compute the frictional loss in laminar and turbulent flows
- Analyse flow between reservoirs

TEXT BOOKS:

1. Modi P.N., Seth S.M., *Hydraulics and Fluid Mechanics Including Hydraulic Machines*, 14th Edition, Standard Book House, 2002.
2. Bansal R.K., *Fluid Mechanics and Hydraulic Machines*, 9th Edition, Laxmi Publications(P) Ltd, New Delhi, 2008.
3. Ramamirtham S., *Fluid Mechanics and Hydraulics and Fluid Machines*, Dhanpat Rai and Sons, Delhi, 2000.

REFERENCES:

1. Kumar K.L., Engineering Fluid Mechanics, Eurasia Publishing House (P) Ltd., New Delhi, 1995
2. Garde R.J. and Mirajgaoker A.G., *Engineering Fluid Mechanics*, SCIITECH Publications (India) Pvt. Ltd, Chennai, 2003.
3. Rajput R.K., *A text book of Fluid Mechanics in SI Units*, S.Chand and Company, New Delhi, 2002
4. Fox, Robert W. and Macdonald, Alan,T., *Introduction to Fluid Mechanics*, John Wiley & Sons, 1995
5. Streeter, Victor L. and Wylie, Benjamin E., *Fluid Mechanics*, McGraw-Hill Ltd., 1998.

22PTCE103 CONCRETE TECHNOLOGY 3 0 0 3

OBJECTIVE

At the end of this course the student shall have a good knowledge about constituent materials and types of special concretes, design procedures for concrete mix and also about concreting of various types of structures and quality control.

UNIT – I: MATERIAL AND THEIR PROPERTIES 9

Cement – constituents – test on cement – types of cement – aggregates – properties and uses – classification of aggregates – properties and test on aggregates – gradation – quality of water – admixtures – accelerators – retarders, requirements of form work – economy in form work – materials for forms – arrangements forms for slabs, beams, columns, walls, culverts, stairs etc – removal of forms.

UNIT – II: FRESH AND HARDENED PROPERTIES OF CONCRETE 9

Properties of fresh concrete – workability – segregation – bleeding – properties of hardened concrete – strength – stress strain characteristics – modulus of elasticity – shrinkage – creep – thermal conductivity – permeability – test for tension, compression and flexure – nondestructive test.

UNIT – III: CONCRETE MIX DESIGN 9

Normal mixes – design mixes – factors influencing the design – Theory and problems on ACI committee 211.1.91 method, DOE method and IS method.

UNIT – IV: SPECIAL CONCRETES AND CONCRETING METHODS 9

Special concretes and mortar, concrete chemical, special elements for accelerated strength gain, vaccum concrete, gunite and shotcrete, epoxy injection, mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic protection. Light weight concrete – ready mixed concrete – fibre reinforced concrete.

UNIT – V: QUALITY CONTROL 9

Frequency of sampling – statistical analysis of test results – standard deviation – coefficient of variation – characteristic strength – acceptance and rejection criteria.

TOTAL: 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Test all the concrete materials as per IS code
- Design the concrete mix using ACI and IS code methods
- Determine the properties of fresh and hardened of concrete
- Design special concretes and their specific applications
- Ensure quality control while testing/ sampling and acceptance criteria

TEXT BOOKS:

1. Shetty M.S *Concrete technology, Volume I & II*, S.Chand and Company Ltd,Deihi 2003
2. Santhakumar A.R *Concrete Technology*, Oxford university Press, NewDelhi, 2007
3. Mehta K.P *Concrete Technology*, Chand & Co, NewDelhi, 2006

REFERENCES:

1. Neville A.M *Properties Of Concrete*, Pitman publishing limited, London. 2004
2. *Indian Standard Recommended Guide lines for Concrete Mix Design*, IS:10262 – 1982 , Bureau Indian Standards, NewDelhi.
3. Indian Standard Specification for Coarse and Fine Aggregates from Natural Sources for Concrete IS:383-1970, Bureau Indian Standards, NewDelhi.
4. Gambhir.M.L,*Concrete technology*, Volume I & II , Tata McGraw-HillBookCompany,Third print, 2003
5. Krishnaraju N. *Design of Concrete Mixes*, CBS publishers. NewDelhi, 2002.

SUB CODE: 22PTMA201 Mathematics - II

SEMESTER-III- Full Time B.E. (Common to All Branches)

And

SEMESTER-II –Part Time B.E. (common To CIVIL, ECE, EEE & MECH.)

L T P C : 3 0 0 3

OBJECTIVES:

- **The objective is to impact analytical skills in the areas of boundary value problems and transform techniques.**
- **It will be necessary for their effective studies in a large number of engineering subjects like heat conduction,communication systems, electro-optics and electromagnetic theory.**
- **It will also serve as a prerequisite for post graduate and specialized studies and research.**

UNIT I FOURIER SERIES 9

Drichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Parseval's Identity – Harmonic Analysis.

UNIT II BOUNDARY VALUE PROBLEMS 9

Classification of second order quasi linear partial differential equations – Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

UNIT III LAPLACE TRANSFORM 9

Laplace Transform- Conditions for existence – Transform of elementary functions – Basic Properties – Transform of derivatives and integrals – Initial and Final value theorems- Transform of periodic Functions – Inverse Laplace Transform- solutions of linear ODE of second order with constant coefficients using Laplace transformation techniques- statement and application of convolution theorem

UNIT IV FOURIER TRANSFORM 9

Statement of Fourier integral theorem – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem - Parseval's Identity

UNIT V Z -TRANSFORM AND DIFFERENCE EQUATIONS 9

Z-transform of simple functions and properties – Inverse Z – transform –initial and final value theorems- Convolution theorem -Formation of difference equations – Solution of difference equations using Z – transform technique.

L=45 PERIODS

OUTCOMES:

On completion of the course, the students will able to

1. Acquired the knowledge of Fourier series
2. Learnt the techniques of solving boundary value problems
3. Familiarize with the transform techniques.

TEXT BOOKS:

1. Veerarajan T, ENGINEERING MATHEMATICS (For Semester III) , 3rd Edition, Tata McGraw Hill Education Pvt. Ltd. , New Delhi, 2009.
2. P.Kandasamy, K.Thilagavathy and K.Gunavathy, "Engineering Mathematics, Volume III", S. Chand & Company ltd., New Delhi, 1996.

REFERENCES:

1. Grewal, B.S., "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, Delhi, 2014.
2. Wylie C. Ray and Barrett Louis, C., "Advanced Engineering Mathematics", Sixth Edition, McGraw-Hill, Inc., New York, 1995.
3. Andrews, L.A., and Shivamoggi B.K., "Integral Transforms for Engineers and Applied Mathematicians", MacMillan, New York, 1988.
4. Narayanan, S., Manicavachagom Pillai, T.K. and Ramaniah, G., "Advanced Mathematics for Engineering Students", Volumes II and III, S. Viswanathan (Printers and Publishers) Pvt. Ltd. Chennai, 2002.

COURSE CODE: 22PTCY201 **L T P C: 3 0 0 3**

ENVIRONMENTAL SCIENCE AND ENGINEERING
[COMMON TO ALL BRANCHES]

AIM

To impart a sound knowledge on the principles of environmental degradation due to pollution involving the different topics required for all engineering branch students.

OBJECTIVES

To make the student conversant with the

- Principles of environmental resources
- Preservation of ecosystem and biodiversity
- Principles of environmental threats and pollution
- Principles of solid waste management
- Environmental issues and ethics

UNIT I ENVIRONMENTAL RESOURCES 9

Forest resources – importance, deforestation – water resources – hydrological cycle – food resources – effects of modern agriculture, fertilizers, pesticides – mineral resources –types – mining - environmental effects of extracting and using mineral resources – Land Resources- Land degradation-soil erosion.

UNIT II ECOSYSTEM AND BIODIVERSITY 9

Environment – biotic and abiotic components – Ecosystem – components – food chain and food web, tropic levels – energy flow in ecosystem, ecological pyramids – ecological succession, types – Biodiversity, types, values of biodiversity, hot spots of biodiversity, threat to biodiversity, endangered and endemic species, conservation of biodiversity – In-situ and Ex-situ conservation.

UNIT III ENVIRONMENTAL POLLUTION 9

Air pollution – classification of air pollutants - gaseous, particulates – sources, effects and control of gaseous pollutants, SO_x, NO_x, H_2S, CO and particulates – control methods – cyclone separator, electrostatic precipitator, catalytic convertor – Water pollution – heavy metal ions pollutants – organic pollutants, oxygen demanding wastes, aerobic and anaerobic decomposition, BOD and COD - experimental determination of BOD only, treatment of domestic and industrial wastewater – Noise pollution –decibel scale - sources, effects and control measures.

UNIT IV ENVIRONMENTAL THREATS AND SOLID WASTE MANAGEMENT 9

Acid rain, green house effect and global warming, ozone layer depletion, photo chemical smog, eutrophication, bio amplification – disaster management – origin, effects and management of earth quake and floods. Solid waste management – solid wastes, classification, origin, effects – treatment methods – composting, sanitary land filling – destructive methods – incineration, pyrolysis, reduce, reuse and recycling – e-waste – sources, effects and disposal

UNIT V SOCIAL ISSUES AND ENVIRONMENTAL ETHICS 9

From unsustainable to sustainable development, objectives and ways of achieving – urban problems related to energy and energy conservation – water conservation and management, rain water harvesting – waste land reclamation. Environmental ethics – consumerism – human population, exponential and logistic growth, variation in population among countries, population explosion, population policy, family welfare programme – population control methods – HIV and AIDS.

TOTAL PERIODS: 45

TEXT BOOKS

1. Elements of Environmental science and Engineering, P.Meenakshi, Prenitce – Hall of India, New Delhi, 2009.

2. A Textbook of Environmental Chemistry and Pollution Control: (With Energy, Ecology, Ethics and Society), Revised Edition, Dr. S.S. Dara, D.D. Mishra Published by S. Chand & Company Ltd, 2014.

REFERENCE BOOKS

1. Introduction to Environmental Engineering and Science, **Gilbert M. Masters**; **Wendell P. Ela** Publisher: Prentice-Hall India, 3rd Edition, 2008.
2. Environmental Science, Eldren D. Enger, Bredley F.Smith, WCD McGraw Hill 14th Edition 2015.

COURSE OUTCOMES:

After successful completion of the course the students should be able to

1. Play an important role in conservation of natural resources for future generation.
2. Paraphrase the importance of ecosystem and biodiversity
3. Analyse the impact of pollution and hazardous waste in a global and social context
4. Understand contemporary issues that result in environmental degradation that would attempt to provide solutions to overcome the problems.
5. Consider the issues of environment and human population in their professional undertakings.

22PTCE201 3 0 0 3

BASIC STRUCTURAL STEEL DESIGN
(Use of IS 800 – 2007 & Steel tables are permitted)

OBJECTIVE

- To learn IS 800-2007 code of practice for the design of Compression, Tension and Flexural members using various cross-sections
- To study the behaviour and design of compression and tension members using simple and built-up sections
- To understand behaviour of flexural members and the design laterally restrained beams
- To study the design of bolted and welded connections and arranging field visit to industries

UNIT – I : INTRODUCTION 9

CONCEPTS OF STRUCTURE: Structural form: Classification of structures based on function, material and shape - different structural systems - basic structural requirements - stability, strength and stiffness. STRUCTURAL LOADS: Dead load - live load - wind load – dynamic and seismic load – thermal load – settlement load – buoyant load – snow load. DESIGN CONCEPTS: Design Process: Codes of practice -Working Stress Method - Limit State Method of Design - Probabilistic approach to design - load and resistance factor design. STEEL STRUCTURES: Introduction: Material - properties of steel– behavior- structural steel sections – Limit State Design Concepts– Loads on Structures – load combinations – partial safety for materials – load safety factors. Other properties: durability – fatigue – fire protection.

UNIT – II : CONNECTIONS 9

Metal joining methods using welding, bolting – Design of bolted and welded joints – weld symbols – strength of fillet and butt welds - Efficiency of joints – High Tension bolts

UNIT – III : TENSION MEMBERS 9

Types of sections – Net area – Net effective sections for angles and Tee in tension – Design of connections in tension members – Use of lug angles – Design of tension splice – Concept of shear lag

UNIT – IV: COMPRESSION MEMBERS 9

Types of compression members – Theory of columns – Current codal provision for compression member design – Slenderness ratio – Design of compression members – Design of lacing and batten – Design of column bases – Gusseted base

UNIT – V: BEAMS 9

Laterally supported beams: classification of sections – simple and compound sections – calculation of plastic modulus of section – flexural strength of beams- design considerations – behavior of web under shear – shear check – deflection check- bearing strength of web – buckling strength of web- web buckling –web crippling.

TOTAL: 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Apply the IS code of practice for the design of steel structural elements
- Analyze the behavior of bolted connections and design them
- Design compression and tension members using simple and built-up sections
- Design of laterally supported beams

TEXT BOOKS:

1. Duggal S.K., *Limit State Design of Steel Structures*, Tata McGraw-Hill Publishing Company , New Delhi, 2010.
2. Subramanian N., *Design of Steel Structures*, First edition, OXFORD university press, 2008
3. Jayagopal L S, 'Structural Steel Design", Vikas Publications, 2012

REFERENCES:

1. Bhavikatti S. S., *Design of Steel Structures by Limit Method*, I.K. International Pvt Ltd, New Delhi, 2009.
2. Ramchandra S., & Virendra Gehlot ., *Limit State Design of Steel Structures*, Standard Publication, New Delhi, 2009.
3. *Teaching Resources for Structural Steel Design* – Vol. I & II, INSDAG, Kolkatta.
4. Gaylord, E.H., Gaylord, N.C., and Stallmeyer, J.E., Design of Steel Structures, 3rd edition, McGraw-Hill Publications, 1992
5. *IS 800:2007 Code of practice for general construction steel*
6. *SP 6 IS Structural steel Design Illustrated Hand book*

22PTCE202 STRENGTH OF MATERIALS 3 0 0 3

OBJECTIVE :

- To study the different methods of determining deflection of beam.
- To analyse the column with different end conditions
- To impart knowledge on analysis of simple and special structures to find internal forces /stresses using various theorems / theories.

UNIT – I : DEFLECTION OF DETERMINATE BEAMS 9

Governing differential equation –Double integration method- Macaulay's method Moment area method -Strain energy and Dummy unit load approaches – Castigliano's first and second theorems .

UNIT – II : STATICALLY INDETERMINATE BEAMS 9

Propped cantilever beams – Fixed beams – Continuous beams – Theorem of three moments – Calculation of reactions, bending moments and shear force – Bending moment and Shear force diagrams.

UNIT – III : THEORY OF COLUMNS 9

Members subjected to an axial Load – eccentric load – Slenderness ratio – End conditions – Buckling load for columns- Euler's theory – Assumptions and limitations – Rankine - Gordon formula – Empirical formula – Straight line formula – Columns subjected to eccentric loading .

UNIT – IV : UNSYMMETRICAL BENDING AND SHEAR CENTRE 9

Stresses due to unsymmetrical bending of beams for symmetrical sections – Shear Centre - Definition – Shear centre for sections symmetrical about one Axis – Moment of inertia – Product of inertia – Principal axes and Principal moment of inertia – Deflection of beams due to unsymmetrical bending.

UNIT – V : THICK CYLINDERS 9

Lame's equation – Hoop stress and radial stress distribution – Compound cylinders – Wire wound cylinders– Shrink fit.

THEORIES OF ELASTIC FAILURE: Maximum principal stress theory – Maximum principal strain theory – Maximum shear stress theory - Maximum strain energy theory – Maximum shear strain energy theory – simple problems.

TOTAL: 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Apply the principle of virtual work
- Determine deflection of a beam for various loading conditions
- Apply unit load method to find the deflection of truss
- Determine different stresses developed in thick cylinders
- Visualize the behavior of column for combined bending and axial loading
- Determine the important mechanical properties of materials
- Demonstrate the different theories of failure for brittle and ductile materials
- Apply the different methods of unsymmetrical bending analysis
- Demonstrate the significance and concept of shear centre
- Apply the principles of structural dynamics

TEXT BOOKS:

1. Rajput R.K., *Strength of Materials*, S.Chand & Company Ltd., New Delhi.2007
2. Dr.Sadhu Singh, *Strength of Materials*, Khanna Publishers, New Delhi.2000

REFERENCES:

1. Vazirani V.N.and Ratwani M.M.,*Analysis of Structures*, Vol - I Khanna Publishers, New Delhi.1997
2. Egor P Popov, *Engineering Mechanics of Solids*, Prentice Hall of India , New Delhi, 2003.
3. Prasad I.B., *Strength of Materials*, Khanna Publishers, New Delhi.2000
4. William Nash, *Theory and Problems of Strength of Materials* , Schaum's outline series, McGraw Hill International Edition , Delhi, 1987
5. Junnarkar S.B. and Shah H.J.,*Mechanics of Structures*, Vol I,Charotar Publishing house, New Delhi,1997.
6. Ramamurtham S. and Narayanan R. *Strength of Materials* , Dhanpat Rai Publishing Company (P) Ltd., Reprint 2011.

22PTCE203 HIGHWAY AND RAILWAY ENGINEERING 3 0 0 3

OBJECTIVE

The objective of the course is to educate the students on various components of highway engineering and railway Engineering. The course enables the students to develop skill on evaluation and maintenance.

UNIT – I : HIGHWAY PLANNING AND ALIGNMENT 9

Highway Development in India - Jayakar Committee Recommendations and Realisations- Requirements of Ideal Alignment- Factors Controlling Highway Alignment-Engineering Surveys for Alignment -Conventional Methods and Modern Methods (Remote Sensing, GIS and GPS techniques)-Classification and Cross Section of Urban and Rural Roads (IRC), Highway Cross Sectional Elements – Right of Way, Carriage Way, Camber, Kerbs, Shoulders and Footpaths [IRC Standards], Cross sections of different Class of Roads.

UNIT – II : GEOMETRIC DESIGN OF HIGHWAYS 9

Design of Horizontal Alignments – Super elevation, Widening of Pavements on Horizontal Curves and Transition Curves [Derivation of Formulae and Problems] Design of Vertical Alignments – Rolling, Limiting, Exceptional and Minimum Gradients, Summit and Valley Curves-Sight Distances - Factors affecting Sight Distances, Stopping Sight Distance (SSD), Overtaking Sight Distance (OSD), Sight Distance at Intersections, Intermediate Sight Distance and Illumination Sight Distance [Derivations and Problems in SSD and OSD]-Geometric Design of Hill Roads [IRC Standards Only]

UNIT – III : HIGHWAY MATERIALS, CONSTRUCTION, MAINTENANCE AND OPERATION 9

Desirable Properties of Highway Materials-Bitumen - Penetration, Ductility, Viscosity, Binder content and Softening point Tests. Construction Practice - Water Bound Macadam Road, Bituminous Road and Cement Concrete Road [as per IRC and MORTH specifications]Highway Drainage [IRC Recommendations]Types of defects in Flexible pavements –Surface defects, Cracks, Deformation, Disintegration – Symptoms, Causes and Treatments. Types of Pavement, Failures in Rigid Pavements – Scaling, Shrinkage, Warping, Structural Cracks Spalling of Joints and Mud Pumping – and Special Repairs.

UNIT – IV : RAILWAY PLANNING AND DESIGN 9

Role of Indian Railways in National Development -Engineering Surveys for Track Alignment – Obligatory points - Conventional and Modern methods (Remote Sensing, GIS & GPS, EDM and other equipments)Permanent Way, its Components and Functions of each Component: Rails - Types of Rails, Rail Fastenings, Concept of Gauges, Coning of Wheels, Creeps -Sleepers – Functions, Materials, Density. Ballasts – Functions, Materials, Ballastless Tracks Geometric

Design of Railway Tracks – Gradients and Grade Compensation, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Horizontal and Vertical Curves (Derivations of Formulae and Problems)

UNIT – V : RAILWAY TRACK CONSTRUCTION MAINTENANCE AND OPERATION 9

Points and Crossings - Design of Turnouts, Signalling, Interlocking, Construction & Maintenance – Conventional, Modern methods and Materials, Track Drainage Track Modernisation– Automated maintenance and upgrading, Technologies, Re-laying of Track, Lay outs of Railway Stations and Yards, Rolling Stock, Tractive Power, Track Resistance, Level Crossings.

TOTAL: 45Hours

OUTCOME :

At the end of the course, the student will be able to:

- Carry out surveys involved in planning and highway alignment
- Design cross section elements, sight distance, horizontal and vertical alignment
- Implement traffic studies, traffic regulations and control, and intersection design
- Determine the characteristics of pavement materials
- Design flexible and rigid pavements as per IRC
- On completing the course, the students will have the ability to Plan and Design various civil Engineering aspects of Railways.

TEXT BOOKS:

1. Khanna K., Justo C.E.G., *Highway Engineering*, Khanna Publishers, Roorkee, 2001.
2. Kadiyali L. R, *Traffic Engineering and Transport Planning*, Khanna Publishers, New Delhi, 2006.
3. Saxena C.S. and Arora S., *A Course in Railway Engineering*, Dhanpat Rai and Sons, Delhi, 2007.

REFERENCES:

1. Sharma S.K., *Principles Practice and Design of Highway Engineering*, S.Chand & Co
Ltd. New Delhi, 2006.
2. Guidelines of Ministry of Road Transport and Highways, Government of India.
3. Agarwal M.M., *Indian Railway Track*, 14th Edition, Prabha and Co., New Delhi, 2002.

22PTMA301 NUMERICAL METHODS L T P C: 3 0 0 3

OBJECTIVES:

- With the present development of the computer technology, it is necessary to develop efficient algorithms for solving problems in science, engineering and technology.
- It gives a complete procedure for solving different kinds of s engineering problems numerically.
- The students would be acquainted with the basic concepts in numerical methods and their uses.

UNIT I SOLUTION OF EQUATIONS 9

Solutions of non linear equations by iteration method and Newton Raphson method-Solutions of linear system of equations by Gauss Elimination, Gauss Jordan, Gauss Jacobi and Gauss Seidal methods-Inverse of a matrix by Gauss Jordan Methods.

UNIT II INTERPOLATION AND APPROXIMATION 9

Finite differences – Operators and their relations – interpolation with Equal Intervals-Newton's Forward and Backward interpolations- Unequal intervals-Newton's divided difference formula and Lagrangian polynomials-Interpolating with cubic spline polynomial.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9

Newton's Forward and Backward Differences to compute derivatives-Trapezoidal rule-Simpson's 1/3 rule, Simpson's 3/8 rule –Two and three point Gaussian quadrature formulas.

UNIT IVINITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9

Solving first order ODE – Single step method: Taylor series method-Euler and modified Euler method-Fourth order Runge-Kutta method- Multistep method: Milne's and Adam's predictor and corrector methods.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATION 9

Finite difference solution of second order ordinary differential equations-Finite difference solutions of one dimensional heat equation by explicit and implicit methods-One dimensional wave equation and two dimensional Laplace and Poisson equations.

L=45 PERIODS

OUTCOMES:

On completion of the course, the students will able to

1. Learn to obtain the numerical solutions of linear and non-linear equations
2. Acquired the techniques of interpolation and approximations
3. Familiarize with the numerical differentiation and integration, will know to solve the initial value problems for ordinary differential equations.

TEXT BOOKS:

1. Veerarajan. T and Ramachandran, "Numerical methods with Programs in C and C^{++} ",Tata McGraw Hill, New Delhi,2006

2. Kandasamy.P, Thilagavathy.K,Gunavathi.K, "Numerical Methods" S.Chand & Co., New Delhi,2005.

REFERENCES:

1. Gerald, C.F. and Wheatley, P.O.," Applied Numerical Analysis" , Sixth Edition , Pearson Education Asia , New Delhi – 2002
2. M.K.Venkataraman, "Numerical Methods",National Publishing Company,2000
3. Jain M.K.Iyengar,K & Jain R.K., "Numerical Methods for Scientific and Engineering Computation ",New Age International (P) Ltd,Publishers 2003
4. Manish Goyal, "Numerical Methods and Statistical techniques Using "C", 1st Edition, Laxmi Publications (p) Ltd, 2009.

22PTCE301 **CONSTRUCTION TECHNOLOGY AND EQUIPMENTS** 3 0 0 3

OBJECTIVE

At the end of this course the student shall have a good knowledge about the materials used and method of construction of various components of buildings and related structures.

UNIT – I : FOUNDATION 9

Objectives of foundation – essential requirements for foundation – types of foundation – settlement of foundation – causes of failure of foundation and remedial measures-deep foundation- piles-precast piles-cast in situ piles-under reamed piles-caissons.

UNIT – II : MASONRY 9

Stone masonry – classification of stone masonry – joints in stone masonry – brick masonry – types of bonds – strength of brick masonry – points to be observed during construction of masonry- comparison of brick masonry and stone masonry.

UNIT – III : FLOORING AND DAMP PROOF COURSE 9

Components of floor- selection of flooring materials-floor finishing-brick flooring – flag stong flooring – cement concrete flooring –granolithic flooring – terrazzo flooring- marble flooring –timber flooring – asphalt flooring – rubber flooring – suitability of floors for various applications – damp proof course – causes of dampness- effect of dampness –methods of damp proofing – materials used for damp proofing.

UNIT – IV : STAIRS AND ROOFING 9

Stairs – requirements of good stairs – classification of stairs –quarter turn stairs- half turn stairs –circular –spiral and helical stairs –stairs made up of different materials-Roofs –types of roofs –requirements – pitched roof –lean to roof-gable roof-hip roof-flat roof - RCC roof.

UNIT – V : CARPENTARY, ARCHES,LINTELS AND FINISHING WORK 9

Location of doors and windows – size of doors – types of doors –arches – classification– stability of an arch – lintels – classification of lintels –scaffolding – component parts – shoring – under pinning – form work – materials used – Indian Standard on form work

Plastering – methods of plastering – defects in plastering – pointing – objectives – methods of pointing – external finishes.

TOTAL: 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Identify the factors to be considered in planning and construction of buildings.
- Understand the construction practices and techniques
- Plan a building following the bye-laws
- Understand the techniques of damp proofing and fire resistance

TEXT BOOKS:

1. Punmia B.C., *Building Constrction* , Laxmi Publications (P) Ltd , NewDelhi,2006
2. Rangwala S.C., *Building Constrction* , Charotar Publishing House , Anand, 2003

REFERENCES:

1. Arora S.P. and Bindra S.P. *Building Construction, Planning Techniques and Methods of construction*, Dhanpat Rai and sons, 2003
2. Peurifoy R.L. *Formwork for Concrete Structures & Construction Planning, Equipment and Methods*, McGraw Hill Book Co., 1999
3. Jha J. and Sinha S.K. *Construction and Foundation Engineering*, Khanna Publishers, 2001.

22PTCE302 SURVEYING 3 0 0 3

OBJECTIVE

- To understand the importance of surveying in the field of civil engineering
- To know the basics of levelling and theodolite survey in elevation and angular measurements
- To understand tacheometric surveying in distance and height measurements
- To get introduced to modern advanced surveying techniques involved such as Total station and GPS

UNIT – I : INTRODUCTION AND LEVELLING 9

Definition- Classifications - Basic principles- Classification - Field work and office work - Level line - Horizontal line - Datum - Bench marks -Levels and staves - temporary and permanent adjustments – Methods of levelling - Fly levelling - Check levelling - Procedure in levelling - Booking -Reduction - Contouring - Methods - Characteristics and uses of contours

UNIT – II : THEODOLITE SURVEYING 9

Theodolite surveying – Study of theodolite – Temporary and permanent adjustments – Measurement of horizontal angels by reiteration and repetition – Measurement of vertical angles - Traversing - Closing error and distribution – Conditions for closure - Omitted measurements.

UNIT – III : TACHEOMETRIC SURVEYING 9

Tacheometric surveying – Principles – Methods – Stadia system –Fixed and Movable hair methods – Methods with staff held vertical and normal – Anallatic lens – Subtense bar – Tangential method.

UNIT –IV : SURVEY ADJUSTMENTS 9

Errors - Sources, precautions and corrections - Classification of errors - True and most probable values - weighted observations - Method of equal shifts - Principle of least squares - Normal equation - Correlates.

UNIT – V : MODERN SURVEYING 9

Total station - Basic Principle – Classifications - Electro-optical system: Measuring principle, Working principle, Sources of Error – Global Positioning System – DGPS - Applications.

TOTAL: 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Use leveling in the field of civil engineering applications such as structural plotting and highway profiling
- Apply the procedures involved in field work and to work as a surveying team
- Plan a survey appropriately with the skill to understand the surroundings
- Take accurate measurements, field booking, plotting and adjustment of errors can be understood
- invoke advanced surveying techniques over conventional methods in the field of civil engineering

TEXT BOOKS:

1. *Duggal, S.K. Surveying Vol. I and II, Tata McGraw Hill, 2004.*

2. Punmia B.C., *Surveying, Vols. I, II and III,* Laxmi Publications, 1989.

REFERENCES:

1. Clark D., *Plane and Geodetic Surveying*, Vols. I and II, C.B.S. Publisher and Distributors, Delhi, Sixth Edition, 1971.
2. James M.Anderson and Edward M.Mikhail, *Introduction to Surveying*, McGraw-Hill Book Company, 1985.
3. Wolf P.R., *Elements of Photogrammetry*, McGraw-Hill Book Company, Second Edition, 1986.
4. Robinson A.H., Sale R.D. Morrison J.L. and Muehrche P.C., *Elements of Cartography*, John Wiley and Sons, New York, Fifth Edition, 1984.
5. Heribert Kahmen and Wolfgang Faig, *Surveying*, Walter de Gruyter, 1995.

22PTCE303 DESIGN OF REINFORCED CONCRETE ELEMENTS 3 0 0 3

(Use of IS 456 – 2000 & charts and tables from SP 16 are permitted)

OBJECTIVE

This course covers the different types of philosophies related to Design of Reinforced Concrete Structures with emphasis on Limit State Method. The design of Basic elements such as slab, beam, column and footing which form part of any structural system with reference to Indian standard code of practice for Reinforced Concrete Structures and Design Aids are included. At the end of course the student shall be in a position to design the basic elements of reinforced concrete structures.

UNIT – I: METHODS OF DESIGN OF CONCRETE STRUCTURES 9

Standard concrete mixes for RCC works – Types of reinforcements – Plain and deformed bars - Concept of Elastic method, ultimate load method and limit state method – Limit State Method – Limit states – Characteristic strength and load – Partial safety factor – Stress strain behaviour of concrete and steel – Advantages – Design codes and specification.

UNIT – II : LIMIT STATE DESIGN FOR FLEXURE 9

Analysis and design of singly and doubly reinforced rectangular and flanged beams – Analysis and design of one way and two way rectangular slabs subjected to uniformly distributed load for various boundary conditions and corner effects – Detailing RC beams & slabs.

UNIT – III: LIMIT STATE DESIGN FOR BOND, ANCHORAGE, SHEAR & TORSION 9

Behaviour of RC members in bond and Anchorage - Design requirements as per IS code - Behaviour of RC beams in shear and torsion - Design and Detailing of RC members for combined bending, shear and torsion.

UNIT – IV: LIMIT STATE DESIGN OF COLUMNS 9

Types of columns – Braced and unbraced columns – Design of short column for axial, uniaxial and biaxial bending – Interaction diagrams - Design concepts of long columns - Standard method of detailing RC columns.

UNIT–V: LIMIT STATE DESIGN OF FOOTINGS & STAIRCASES 9

Design of wall footing – Design of isolated footing – square, rectangular shape footing for axial load– Design of staircases (ordinary & Doglegged).

TOTAL: 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Apply the fundamental concepts of working stress method and limit state method
- Use IS code of practice for the design of concrete elements
- Design the beams, slab, stairs, column and footing
- Draw various RCC structural elements
- The student shall be in a position to design the basic elements of reinforced concrete structures.

TEXT BOOKS:

1. Punmia B.C., Asok kumar jain & Arun kumar jain., Limit State Design of Reinforced Concrete, Laxmi Publications Pvt. Ltd., New Delhi,2007
2. Jain A.K., Limit State Design of RC Structures, Nemchand Publications, Roorkee
3. Ramamurtham S., Design of Reinforced Concrete Structures, Dhanpat Rai Publishing Company, New Delhi, 2016.

REFERENCES:

1. Sinha S.N., Reinforced Concrete Design, Tata McGraw-Hill Publishing Company
Ltd.,New Delhi
2. Vargheese P.C., Limit State Design of Reinforced Concrete, Prentice Hall of India,
Pvt. Ltd., New Delhi,2006.
3. Krishna Raju N., Design of Reinforced Concrete Structures, CBS Publishers & Distributors, New Delhi,2008
4. Dayaratnam P., Limit State Design of Reinforced Concrete Structures, OXFPRD &
IBH Publishing Co. Pvt. Ltd., New Delhi,2004
5. IS 456:2000 Plain and Reinforced concrete Code of practice (Third Revision)
6. SP :16 Design aids for Reinforced Concrete to IS 456-1978.
7. SP : 34 – 1987 Hand book on Concrete Reinforcement and Detailing

22PTCE304 STRUCTURAL ANALYSIS – I 3 0 0 3

OBJECTIVE

To impart Knowledge on rolling loads and their effects in causing Maximum bending moments and Shear forces/axial forces in beams, trusses, arches, suspension bridges analytically and using influence lines. Plastic analysis of structures is also discussed.

UNIT – I : STATIC, KINEMATIC INDETERMINANCIES AND ROLLING LOADS ON SIMPLY SUPPORTED BEAMS 9

Concept of determinancy and indeterminancy-static and kinematic indeterinancies-examples - Single Concentrated load moving on the span – UDL Longer than the span – UDL Shorter than the span – Two concentrated loads at a fixed distance apart - Equivalent UDL.

UNIT – II : INFLUENCE LINES FOR STATICALLY DETERMINATE BEAMS AND PLANE TRUSSES 9

Influence lines for reactions – Influence lines for Shear force – Influence lines for Bending Moment – Calculation of S.F. & B.M. at a point – Calculation of position of load for maximum S.F. & B.M. – Uniformly distributed load shorter than the span on simply supported beam – Concentrated loads - Absolute maximum B.M. & S.F.

UNIT – III : THREE HINGED, TWO HINGED ARCHES 9

Symmetrical arches – Analysis of three hinged and two hinged arches – S.F., Normal thrust & B.M. – Effect of rib – shortening – Parabolic arch subjected to UDL.

UNIT – IV : CABLES AND SUSPENSION BRIDGES 9

Analysis of cable under concentrated loads - Analysis of cable under UDL – Shape of cable under self weight – Anchorage of suspension cables – B.M. & S.F. in three hinged stiffened girders - Maximum B.M. due to single concentrated load – UDL - Two hinged stiffening girders.

UNIT – V : PLASTIC ANALYSIS OF STRUCTURES 9

Plastic moment capacity of sections – Plastic section modulus – Shape factor for rectangular, triangular, circular and hollow circular sections – Plastic hinge concept – Load factor – Plastic analysis – Basic theorems – Principle of virtual work – Determination of collapse load for simply supported beam, propped cantilever beam, fixed beam, continuous beam subjected to concentrated load and UDL – Collapse load for single storey single bay portal frames.

TOTAL : 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Use various classical methods for analysis of indeterminate structures
- Determine the effect of support settlements for indeterminate structures
- Apply the concepts of ILD and moving loads on determinate structures
- Apply the concept of equivalent UDL

TEXT BOOKS:

1. Punmia B.C., *Theory of structures - Vol. II*, Laxmi Publications (P) Ltd, 2004.
2. Negi L.S. and Jangid R.S., *Structural Analysis*, Tata McGraw - Hill Publishing Company,New Delhi, 1997.

REFERENCES:

1. Vaidyanathan R. and Perumal P., *Comprehensive Structural Analysis – Vol. I & II*,
Laxmi Publications (P) Ltd., New Delhi.
2. Timoshenko S.P. and Young D.H., *Theory of Structures*, McGraw – Hill Book Company, New Delhi, 1965.
3. Gupta S.P.,Pandit G.S and Rajesh Gupta,*Theory of structures-Vol I & II*, Tata McGraw-Hill Publishing Company Limited,New Delhi,1999
4. Reddy C.S.,*Basic Structural Analysis*, Tata McGraw-Hill Publishing Company Limited, New Delhi,1999.

22PTCE401 ENVIRONMENTAL ENGINEERING - I 3 0 0 3

OBJECTIVE

This subject deals with the planning of water supply scheme, sources and estimation of water. Also transmission of water, quality analysis, treatment and distribution of water is dealt with. On completion of the course, the student is expected to know about the design of water supply scheme, treatment and distribution of water.

UNIT – I : OBJECTIVES AND ESTIMATION OF WATER 9

Objectives of Public Water Supply schemes - Health, Acceptability, Adequacy, Convenience and Economy - Standards and Planning factors for public water supply schemes in India - Water demand – types – factors affecting - Variations in Demand - Population forecasts - estimation of quantity of water – design period.

UNIT – II : SOURCES OF WATER 9

Surface and Groundwater sources - Intake structures- Infiltration galleries - Wells - Construction, development and sanitary protection of wells - Estimating yields of wells - Steady state conditions. (No derivation)

UNIT – III : TRANSMISSION OF WATER 9

Pipes for transmitting water - Hydraulics of pipe flow - Pipe sizing - Materials for pipes - Selection of pipe materials - Laying, jointing and testing of pipes - Pipes appurtenances - Selection of pumps -Pumps and pumping stations.

UNIT – IV : TREATMENT OF WATER 9

Characteristics and analysis of water – Water quality standards - Unit processes of water treatment - Principles and design of sedimentation, sedimentation cum coagulation, flash mixing, flocculation, filtration and disinfection. Principles of water softening, aeration, iron and manganese removal, fluoride removal - corrosion control

UNIT – V : DISTRIBUTION AND STORAGE 9

Types, functions and requirements of distribution system - Elevated and ground level reservoir - Location - equalizing and service reservoir - Determination of storage capacity – Appurtenances - Operation and maintenance - Leak detection - Analysis of distribution networks - Hardy Cross method.

TOTAL: 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Identify the various sources of water and estimate the demand for water
- Get an insight about drinking water supply systems, including water transport, treatment and distribution
- understand the water quality criteria and standards, and their relation to health and suitability for drinking and other purposes
- the ability to design and evaluate water supply project alternatives on basis of chosen selection criteria

TEXT BOOKS:

1. Garg S.K., *Water Supply Engineering*, Khanna publishing Co., New Delhi - 2007
2. Punmia B.C., Ashok Jain, Arun Jain, Environmental Engineering (Vol.-I), Water
Supply Engineering, Laxmi Publications, New delhi , 2008.
1. Duggal K.N., Elements of Public Health Engineering, S.Chand and Co., 2007.

REFERENCES:

1. Fair G.M., Geyer J.C.,Water Supply and Waste Water Disposal, John Wiley and Sons, 1954.
2. Birdie G.S., Water Supply and Sanitary Engineering, Dhanpat Rai and sons, 2007.

22PTCE402 MECHANICS OF SOILS 3 0 0 3

OBJECTIVE

After undergoing this course, the student acquires adequate knowledge on Engineering properties of soil, effect of ground water on soil, Stress distribution in soil, methods to find shear strength of soils.

UNIT – I : BASIC PROPERTIES OF SOILS 9

Soil formation – Soil problems in Engineering – Physical properties of soil – Phase relations – Index properties of soil – Grain size distribution – Atterberg's limits – Classification of soils – BIS classification – Field identification.

UNIT – II : STRESSES IN SOILS 9

Soil water –Static pressure in water-Effective stress concepts in soils – Capillary phenomenon – Vertical stress distribution in soils – Boussinesq equation – Vertical stress distribution diagrams - Line load – Uniformly loaded areas – Newmark's Influence Chart – Construction and Use – Approximate methods – Isobars – Westerguards equation.

UNIT – III : PERMEABILITY AND SEEPAGE 9

One dimensional flow through soil – Permeability – Darcy's Law – field and laboratory test- flow through stratified soil – Factors affecting permeability of soil. Seepage pressure – Quick sand condition – Two dimensional flow – Laplace equation – Electrical analogy – Flow net – Methods of construction, properties and applications – application of sheet pile cut off and earth dam – Phreatic line.

UNIT – IV : COMPACTION AND CONSOLIDATION 9

Compaction – laboratory tests – Standard Proctor's Compaction test – Modified Proctor's Compaction – Moisture density relation – factors affecting compaction – Field compaction methods – Compaction control.
Consolidation – Components of settlement – Laboratory test – Terzaghi's One Dimensional Consolidation – Definition – Normally consolidated clay – Over Consolidated clay – Under Consolidated clay – e -log ρ relationship – Boundary condition – Time factor – Time rate of consolidation -$\sqrt{t}$ and log t methods-Factors influencing compression behavior of soils.

UNIT – V : SHEAR STRENGTH 9

Shear strength of soil – importance and use – Mohr – Coulomb's theory – Laboratory test – Direct shear test – Triaxial Compression test – Types of Triaxial test based on drainage conditions – Unconfined Compression Test – Vane Shear test – Factors affecting the Shear Strength.

TOTAL: 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Carry out soil classification
- Solve three phase system problems
- Solve any practical problems related to soil stresses estimation, permeability and seepage including flow net diagram
- Estimate the stresses under any system of foundation loads
- Solve practical problems related to consolidation settlement and time rate of settlement

TEXT BOOKS:

1. Punmia B.C *Soil Mechanics and Foundations*, Laxmi Publications Pvt. Ltd., New Delhi, 1995.
2. Venkataramaiah, C., *Geotechnical Engineering*, New Age International Publishers, New Delhi, 1995.

REFERENCES:

1. Arora K.R., *Soil Mechanics and Foundation Engineering*, Standard Publishers and Distributors, New Delhi, 1997.
2. Gopal Ranjan and Rao A.S.R., *Basic and Applied Soil Mechanics*, New Age International Publishers (P) Ltd., New Delhi, 2000.

22PTCE403 STRUCTURAL ANALYSIS – II 3 0 0 3

OBJECTIVE :

To impart Knowledge on energy theorems and their application, analysis of indeterminate structures by classical and matrix methods.

UNIT – I : INFLUENCE LINES FOR STATICALLY INDETERMINATE STRUCTURES 9

Principles of Superposition – Castingliano's second theorem –Maxwells theorem of reciprocal deflection – Betti's theorem – Muller's Breslau's principle and its applications to determine the influence lines for continuous beams.(two span only) Analysis of plane trusses with maximum two redundant members by displacement and force methods – Trusses with lack of fit – Thermal stresses.

UNIT – II : SLOPE DEFLECTION METHOD 9

Slope deflection equations-Analysis of continuous beams – Analysis of single Storey single bay rectangular portal frames with and without side sway.

UNIT – III : MOMENT DISTRIBUTION METHOD 9

Analysis of continuous beams - Carry over factor – Distribution factor – Analysis of single storey single bay– Symmetry and anti-symmetry structures.

UNIT – IV : MATRIX FLEXIBILITY METHOD 9

Analysis of continuous beams, Indeterminate frames and trusses with maximum two degrees of static indeterminacy.

UNIT – V : MATRIX STIFFNESS METHOD 9

Analysis of continuous beams, Indeterminate frames and trusses with maximum two degrees of kinematic indeterminacy.

TOTAL: 45 Hours

OUTCOME :
At the end of the course, the student will be able to:

- Apply the concepts of influence line diagram for continuous beams and trusses
- Analyse indeterminate structures using force and displacement methods

TEXT BOOKS:

1. Hibbeler R.C. Structural analysis, Pearson Education, Noida, 2008.
2. Punmia B C., *Theory of Structures Vol. II*, Laxmi Publications (P) Ltd., New Delhi.
   2004
3. C.S.,*Basic Structural Analysis*, Tata McGraw-Hill Publishing Company Limited,NewDelhi,1997
4. Rajasekaran S., Sankara Subramanian G., Computational Structural Mechanics, PHI, India, 2010.

REFERENCES:

1. Sterling Kinney J., *Indeterminate Structural Analysis*, Narosa Publishing house Delhi,1987 Reddy
.
2. Negi L.S and Jangid R.S.,*Structura Analysis*, Tata McGraw-Hill Publishing Company Limited,NewDelhi,1997
3. Manickaselvam V.K., *Elements of Matrix and Stability Analysis of structures* , Khanna Publishers, 1999, New Delhi.
4. Pandit G.S and Gupta S.P.,*Structural Analysis-A matrix approach*,Tata McGraw-Hill Publishing Company Limited,NewDelhi,2006.
5. Devados Menon,*Advanced Structural Analysis*,Narosa Publishing House, NewDelhi, 2009.

22PTCE404 DESIGN OF STEEL STRUCTURES 3 0 0 3

(Limit State Design)

(Use of IS 800 – 2007& Steel tables are permitted)

OBJECTIVE

This course covers the design of structural steel members subjected to compressive, tensile and bending loads, as per current codal provisions including connections. Design of structural systems such as roof trusses, gantry girders are included.

UNIT – I : CONNECTIONS 9

Design of bolts and weld connections (Stiffened and Seated connections) – Beam to Beam Connections-Beam to Column Connections.

UNIT – II: CHIMNEYS 9

Design of Chimneys – Self Supporting type- Guyed type at single level – Foundation for Chimney.

UNIT – III: BEAM-COLUMNS 9

Introduction – Behaviour of Beam-columns –Elastic-Torsional buckling – Nominal strength-instability in the plane of bending – Beam-column under biaxial loading – Interaction equations for local capacity check – Code design procedure – problems.

UNIT – I : BULT-UP GIRDER 9

Design of Plate girders bolted and welded –Design of stiffeners and splices-Gantry girder

UNIT – V: ROOF TRUSSES 9

Roof truss –Dead load, Live load and Wind load Calculations-Types of trusses-Design of purlin- Design of roof truss.

TOTAL:45 Hours

TEXT BOOKS:

1.Duggal S.K., *Limit State Design of Steel Structures*,Tata McGraw-Hill Publishing Company , New Delhi, 2010.
2. Subramanian N., *Design of Steel Structures*, First edition, OXFORD university press, 2008
3.Bhavikatti S S., *Design of Steel Structures by Limit Method*, I.K. International Pvt Ltd, New Delhi, 2009.

REFERENCES:

1.Chandra R., *LimitState Design of Steel Structure Vol – I & II*, Scientific Publisher, New Delhi,2009.
2.Ramachandra S., & Virendra Gehlot D.,*LimitState Design of Steel Structures –*, Standard Publication, New Delhi,2009.
3. Dayaratnam P., *Design of Steel Structures*, Second Edition, S. Chand & Company, 2003
4. *Teaching Resources for Structural Steel Design – Vol.I & II*, INSDAG, Kolkatta
5.*IS 800:2007 Code of practice for general construction steel*
6.*SP 6 IS Structural steel Design Illustrated Hand book*
7.*IS 875:1987 Code of practice for Design loads (other than earthquake) for buildings and structures (Part – I) Dead loads (Part – II) Live loads (Part – III) Wind loads*
8.*IS 6533:1989 (Part – I) Design and Construction of Steel Chimney (Structural Aspect)*

22PTCE501 APPLIED HYDRAULIC ENGINEERING 3 0 0 3

OBJECTIVE

Student is introduced to open channel flow characteristics including hydraulic jump and surges. Hydraulic machines viz flow through turbines and pumps including their performance characteristics and design aspects are taught. Student, at the end of the semester will have the abilities to analyse flow characteristics in open channel and design hydraulic machines.

UNIT – I : OPEN CHANNEL FLOW 9

Open channel flow – Types and regimes of flow – Wide open channel – Specific energy – Critical flow and its computation. Uniform flow – Velocity measurement – Manning's and Chezy's formula –Determination of normal depth and velocity – Most economical sections

UNIT – II : VARIED FLOW 9

Dynamic equations of gradually varied flow – Assumptions – Draw down and back water curves -Characteristics of flow profiles — Profile determination – Direct step method - Hydraulic jump – Types – Energy dissipation – Surges in channels

UNIT – III : MOMENTUM PRINCIPLE 9

Impulse momentum equation – application of linear momentum principle – Impact of jet – force exerted by a jet on normal, inclined and curved surfaces for stationary and moving cases – angular momentum principle – construction of velocity vector diagrams – jet propulsion of ships.

UNIT – IV : HYDRAULIC TURBINES 9

Classification – working principles and design of Pelton wheel, Francis and Kaplan turbines – Velocity triangles – efficiencies – draft tube - theory and types – specific speed – operating characteristics – governing of turbines.

UNIT – V : PUMPS 9

Classification - Centrifugal pump – working principle –velocity triangle - minimum speed to start the pump – multistage pumps – specific speed - performance curves – Reciprocating pump – components and working – slip - indicator diagram and its variation - air vessel – working principle of Jet and submersible pump.

TOTAL: 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Visualize fluid flow phenomena observed in Civil Engineering systems such as flow in a pipe, flow measurement through orifices, mouth pieces, notches and weirs
- Analyze fluid flows in open channel hydraulics and devices such as weirs and flumes
- Apply dimensional analysis
- To study types of centrifugal Pumps, work done and efficiency of the different types centrifugal pumps and also study about performance of pumps & characteristic curves
- To study about specific speed and performance characteristics of different types of turbines

TEXT BOOKS:

1. Ramamirtham S., *Fluid Mechanics and Hydraulics and Fluid Machines*, Dhanpat Rai and Sons, Delhi, 2008.
2. Bansal R.K., *Fluid Mechanics and Hydraulic Machines*, 9th Edition, Laxmi Publications(P) Ltd, New Delhi, 2005.

REFERENCES:

1. Subramanya K., *Flow in Open channels*, Tata McGraw-Hill Publishing Company, 1994.
2. Rama Durgaiah D., *Fluid Mechanics and Machinery*, New Age International Publishers, New Delhi, 2002.
3. Rajput R.K., *A text book of Fluid Mechanics in SI Units*, S.Chand and Company, New Delhi, 2002
4. Jain A.K., *Fluid Mechanics (including Hydraulic Machines*), Khanna Publishers, 8th edition, 1995.

22PTCE502 FOUNDATION ENGINEERING 3 0 0 3

OBJECTIVE:

At the end of this course, the student acquires the capacity to investigate the soil characteristics and to design suitable foundation.

UNIT – I: SOIL EXPLORATION AND SELECTION OF FOUNDATION 9

Soil exploration methods – Disturbed and Undisturbed sampling – Samplers – Depth of Exploration – Number and Spacing of boreholes – Sounding tests – Standard Penetration Test, Static Cone and Dynamic Cone Penetration Tests – Bore log.

Requirements of good foundation – factors governing location and depth

Types of foundation – Choice of foundation – Floating Foundation – Foundation on Expansive soil.

UNIT – II : BEARING CAPACITY OF SOIL AND SETTLEMENT 9

Bearing Capacity – Terzhaghi's Bearing Capacity Equation – Types of Failure – Effect of Water Table – Skempton's Formula – Bearing Capacity based on IS method- Effect of eccentricity of load on bearing capacity of soil – Bearing Capacity based on 'N' value - Allowable bearing pressure – Plate Load test – Methods of Improving Bearing Capacity of soil.

Settlement – immediate and time dependent settlement – Differential settlement – Causes – BIS Code provisions – Proportioning of Footing.

UNIT – III : PILE FOUNDATION 9

Classification of Piles – Functions – Merits – Load Carrying Capacity – Static Analysis – Dynamic Analysis – Pile load test – Pile group – Spacing and Group action – Efficiency of Pile group – Engineering News Formula – Hammers – Settlement – Negative Skin Friction – uplift capacity - Construction of Under Reamed Pile Foundation.

UNIT – IV : STABILITY OF SLOPES 9

Stability of Slopes – Infinite and Finite Slopes – Types of Failure – Culmann's methods –Swedish Slip Circle Method – Friction Circle method – Bishop's method – Taylor's Stability Number – Slope protective measures.

UNIT – V : EARTH PRESSURE ON RETAINING WALLS 9

Plastic equilibrium in soils – Active and Passive states – Rankine's theory – Cohesionless and cohesive soils – Couloumb's wedge theory – Earth pressure on retaining walls of simple configurations –Stability of retaining walls.

TOTAL: 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Characterise soil investigation for any civil engineering construction
- Analyse earth retaining structures for any kind of soil medium
- Estimate bearing capacity using IS code methods
- Design proper foundations for any kind of shallow foundation system
- Estimate pile and pile group capacity for any kind of soil including group efficiency and negative

TEXT BOOKS:

1. Punmia B.C *Soil Mechanics and Foundations*, Laxmi Publications Pvt. Ltd., New Delhi, 1995.
2. Purushothama Raj P, *Soil Mechanics and Foundation Engineering*, Perason Education, 2008
3. V.N.S. Moorthi

REFERENCES:

1. Swamisaran, *Analysis and Design of Structures – Limit State Design*, Oxford IBH Publishing Co-Pvt. Ltd., New Delhi, 1998.
2. Venkataramaiah, C., *Geotechnical Engineering*, New Age International Publishers, New Delhi, 1995.
3. Som N.N and Das S.C., *Theory and Practice of Foundation Design*, Prentice Hall Pvt. Ltd., New Delhi, 2003.
4. Gopal Ranjan and Rao A.S.R., *Basic and Applied Soil Mechanics*, New Age International Publishers (P) Ltd., New Delhi, 2000.
5. Arora K.R., *Soil Mechanics and Foundation Engineering*, Standard Publishers and Distributors, New Delhi, 1997

22PTCE503 DESIGN OF REINFORCED CONCRETE AND MASONRY STRUCTURES 3 0 0 3

OBJECTIVE

To give an exposure to the design of combined footings, walls, water tanks , flat slab and brick masonry structures and to introduce yield line theory.

UNIT – I : FOOTINGS 9

Design of rectangular combined footings - Design of trapezoidal combined footings for axially loaded column – Design of mat and raft foundation.

UNIT – II : RETAINING WALLS 9

Cantilever retaining wall – check for structural stability – design of concrete thickness and reinforcement for stem, heel and toe slab - counter fort retaining wall - check for structural stability – design of concrete thickness and reinforcement for stem, counter fort, heel and toe slab.

UNIT – III : FLAT SLAB DESIGN & YIELD LINE THEORY 9

Design of flat slabs – interior panel and end panel – column strip – middle strip – with and without column head – reinforcement details – Yield line - characteristics - Application of virtual work method to square, rectangular, circular and triangular slabs.

UNIT – IV : WATER TANK DESIGN (L.S.D) 9

Elevated water tank – circular and rectangular tank – flat and domed roofs - Underground rectangular tanks– Design of staging and foundations

UNIT – V : BRICK MASONRY 9

Introduction - Classification of walls - Lateral supports and stability - effective height of wall and columns - effective length of walls - design loads – shape factor for masonry units - load dispersion, permissible stresses - design of axially and eccentrically loaded brick walls as per BIS code.

TOTAL: 45 Hours

TEXT BOOKS:

1. Punmia B.C., Asok kumar jain & Arun kumar jain., Limit State Design of ReinforcedConcrete, Laxmi Publications Pvt. Ltd., New Delhi,2007
2.Dayaratnam P., LimitState Design of Reinforced Concrete Structures, OXFORD&
IBHPublishing Co. Pvt. Ltd., New Delhi,2004
3.Ramamrutham S., Design of Reinforced Concrete Structures, Dhanpat Rai Publishing Company, New Delhi,2007
4. Shah H.J., Reinforced Concrete Vol.-II, Charotar Publishing House, Anand, 2000
5. Dayaratnam P., *Brick and Reinforced Brick Structures*, OXFPRD & IBH Publishing
Co. Pvt. Ltd., New Delhi,2004

REFERENCES:

1.Krishna Raju N., Design of Reinforced Concrete Structures, CBS Publishers &Distributors, New Delhi,2008
2.Syal I.C. and Goel A.K., Reinforced Concrete Structures, A.H. Wheelers & Co. Pvt.Ltd., 1994
3.Ram Chandra, LimitState Design, Standard Book House.2006
4.IS 456:2000, Plain and Reinforced concrete Code of practice (Third Revision)
5. SP :16, Design aids for Reinforced Concrete to IS 456-1978.
6. SP : 34 – 1987 Hand book on Concrete Reinforcement and Detailing
7. IS 3370:1967 Code of practice for Concrete Structures for Storage of liquids (Part – I, II & IV)
8. IS 1905:1987 Code of Practical for Structural Use of Unreinforced Masonry

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OUTCOME :

At the end of the course, the student will be able to:

- apply the concepts of liquid retaining structures
- draw the various RCC structures
- design the masonry elements

22PTCE504 ESTIMATION, QUANTITY SURVEYING AND VALUATION 3 0 0 3

OBJECTIVE

This subject covers the various aspects of estimating of quantities of items of works involved in buildings, water supply and sanitary works, road works and irrigation works. This also covers the rate analysis, valuation of properties and preparation of reports for estimation of various items. At the end of this course the student shall be able to estimate the material quantities, prepare a bill of quantities, make specifications and prepare tender documents. Student should also be able to prepare value estimates.

UNIT – I: INTRODUCTION 9

Types of estimates – Units of measurements – Methods of estimates – Advantages- Load bearing and framed structures

UNIT – II : ESTIMATE OF BUILDINGS 9

Calculation of quantities of brick work, RCC, PCC, Plastering, white washing, colour washing and painting / varnishing for shops, rooms, residential building with flat and pitched roof – Various types of arches – Calculation of brick work and RCC works in arches – Estimate of joineries for panelled and glazed doors, windows, ventilators, handrails etc.

UNIT – III : ESTIMATE OF OTHER STRUCTURES 9

Estimating of septic tank, soak pit – sanitary and water supply installations – water supply pipe line – sewer line – tube well – open well – Estimate of bituminous and cement concrete roads – Estimate of retaining walls – culverts – Estimating of irrigation works – aqueduct, syphon,.

UNIT – IV: SPECIFICATION AND TENDERS 9

Data – Schedule of rates – Analysis of rates – Specifications – sources – Detailed and general specifications – Tenders – Contracts – Types of contracts – Arbitration and legal requirements.

UNIT – V: VALUATION AND REPORT PREPARATION 9

Necessity – Basics of value engineering – Capitalised value – Depreciation – Escalation – Value of building – Calculation of Standard rent – Mortgage – Lease - Principles for report preparation – report on estimate of residential building – Culvert – Roads – Water supply and sanitary installations – Tube wells – Open wells.

TOTAL: 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Apply different types of estimates in different situations
- Carry out analysis of rates and bill preparation at different locations
- Demonstrate the concepts of specification writing
- Carry out valuation of assets

TEXT BOOKS:

1. Dutta, B.N., *Estimating and Costing in Civil Engineering*, UBS Publishers &Distributors Pvt. Ltd., 2007
2. Kohli, D.D and Kohli, R.C., *A Text Book of Estimating and Costing (Civil*), S.Chand &Company Ltd., 2007

22PTCE601 ENVIRONMENTAL ENGINEERING-II 3 0 0 3

OBJECTIVE

The subject aims to give the students, the knowledge about the sewage water and waste water treatment. Students are introduced to the new world of waste water treatment technologies which prevails in the current scenario. Students, at the end of the semester will have complete ability to analysis the type of sewage and the treatment to be carried out to reuse the water.

UNIT – I : SWERAGE SYSTEM 9

Definition – classification – systems of sewerage – quantity of sewage – Fluctuation in flow pattern – estimation and storm runoff – design flow for separate and combined system – hydraulics of sewers – self cleansing velocities – full flow / partial flow conditions – sewer sections – material for sewers - sewer joints – jointing materials – sewer laying under various conditions – test on sewers – sewer maintenance – sewer appurtenances –sewage pumping – types of pumps.

UNIT – II: WASTE WATER CHARACTERISTICS&PRIMARY TREATMENT 9

Characteristics and composition of sewage – physical and chemical analysis – DO and BOD and their significances – cycles of decomposition – fundamentals of microbiology of wastewater – preliminary and primary treatment – screens– skimming tank – grit chamber – design of proportional flow weir– principle, types of sedimentation – design of sedimentation tanks.

UNIT – III: BIOLOGICAL TREATMENT OF WASTEWATER 9

Basic principles of biological treatment – Activated sludge process – recirculation – diffuser – mechanical aeration – Process modifications – oxidation ditch – Trickling filter – Principles and design –NRC equation – RBC Principle – Principles and design of waste stabilization ponds – Principle and design of a lagoon - septic tanks and effluent disposal system.

UNIT – IV: SLUDGE MANAGEMENT & HOUSE DRAINAGE 9

Objectives of sludge treatment – properties and characteristics of sludge – sludge thickening – sludge digestion – drying beds – conditioning and dewatering – sludge disposal – Sanitary fixtures and fitting – Pipe system – general layout of house drainage – street connections.

UNIT – V: SEWAGE DISPOSAL 9

Methods – dilution – self purification of streams – oxygen sag curve – Streeter Phelp's model - wastewater reclamation techniques – land disposal – sewage farming – deep well injection – Eutrophication – recycle and reuse of wastewater.

TOTAL: 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Understand the sewerage system and the different ways to treat the waste water.
- Design the treatment plant for different types of waste water
- Understand the importance of water and so to recycle and reuse the waste water

TEXT BOOKS:

1. Garg S.K., *Waste Water Engineering*, Khanna publishing Co., New Delhi - 2007.
2. Punmia B.C., Ashok Jain, *Environmental Engineering(Vol.-II),Wastewater Engineering*, Laxmi Publications, New Delhi , 2008.

REFERENCES:

1. Duggal K.N., *Elements of Public Health Engineering*, S.Chand and Co., 2007.
2. *Manual on Sewerage and Sewage Treatment*, CPHEEO, Government of India, New Delhi, 1983.
3. *Hand Book on Water Supply and Drainage*, SP 35, B.I.S., New Delhi,1987.
4. Metcalf and Eddy,M.C., *Wastewater Engineering – Treatment & Reuse*,Tata Mc Graw-Hill Publications, New Delhi,2003.
5. Birdie G.S., *Water Supply and Sanitary Engineering*, Dhanpat Rai and sons, 2007.

22PTCE602 WATER RESOURCES ENGINEERING 3 0 0 3

OBJECTIVE :

Students are introduced to know the importance of hydraulic cycle, as water is the main source for the nature. Storage of water by means of reservoir and wells are taught. The designs of various distribution system of the stored water for commercial and industrial purpose are explained and the water is tracked using GIS application.

UNIT – I: SURFACE WATER HYDROLOGY 9

Hydrologic cycle – Surface Water potential in India -Rain gauges – Types of rain gauges -Average rainfall over a basin by arithmetic mean, Thiessen polygon and Isohyetal method – Run off – Run off process – abstractions- Infiltration, evaporation, transpiration, interception and depression storage – Estimation of Run off by empirical formula and infiltration indices. Storm Hydrograph and Unit Hydrograph – Flood estimation by Dicken's formula.

UNIT – II: RESERVOIR PLANNING 9

Importance of Reservoirs - Purpose of storage work – Large Reservoirs in India and Tamil Nadu -Types of reservoirs– Investigation for reservoir planning – Selection of site for a reservoir – Zones of storage in reservoirs – Single and multipurpose reservoir – Determination of capacity of reservoir - Reservoir sedimentation and their control – Reservoir losses – Basics of flood routing.

UNIT – III: GROUND WATER HYDROLOGY 9

History of Groundwater Development in the world and India - Occurence of ground water – types of aquifers – storage coefficient – coefficient of transmissibility – Steady radial flow into a well located in unconfined and confined aquifers – description of various types of open and tube wells – Yield from an open well by constant level pumping test and recuperation test – Estimation of Yield (steady state condition)- Site selection for a tube well.

UNIT – IV: DISTRIBUTION SYSTEM 9

Classification of canals – canal alignment – Kennedy's theory – Wood table – Lacey's theory – Design of canal cross sections – Comparisons of two theories – Use of Garret's diagram in channel design – Balancing depth of cutting – Design procedure for an irrigation channel – Longitudinal section of canal and schedule of area statistics – types of canal cross sections – component parts of a cross section – Construction and maintenance of canals – Canal lining – GIS application in distribution system.

UNIT – V: WATER LOGGING, DRAINAGE AND RIVER CONTROL 9

Water logging – importance, Causes and effects of water logging– Remedial measures – Drainage – Advantages – Types of drainage system – Rivers and their behavior – Objectives – Classification and method of river training works - GIS application.

TOTAL : 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Design various channel systems
- Design head and cross regulator structures
- Identify various types of reservoir and their design aspects
- By the Establishes the understanding of cross drainage works and its design
- Design different types of dams

TEXT BOOKS:

1. Linsley R.K. and Franzini J.B, *Water Resources Engineering*, McGraw-Hill Inc, 2002.
2. Sharma R.K. and Sharma T.K., *Hydrology and Water Resources Engineering*, Dhanpat Rai and Sons, 2002.
3. Punmia B.C. and Pande B.B.Lal, *Irrigation and water Power Engineering*, Laxmi Publications Pvt Ltd., New Delhi,2009.
4. Santhosh Kumar Garg, *Hydrology and Water Resources Engineering* , Khanna Publications Pvt.Ltd.,New Delhi,2002.

REFERENCES:

1. Chow V.T. and Maidment, *Hydrology for Engineers*, McGraw-Hill Inc., Ltd., 2000
2. Raghunath H.M., *Hydrology*, Wiley Eastern Limited,New Delhi,1990.
3. Subramanya K., *Engineering Hydrology*, Tata-McGraw Hill , 1993.
4. Sahasrabudhe S.D., *Irrigation Engineering and Hydraulics Structures*, Katson Publications, 1990.
5. Das M.M., Saikia M.D., *Hydrology*, Prentice Hall of India, 2008.

22PTCE603 DESIGN AND DRAWING (Concrete and Steel) 0 0 3 2

(Use of IS 456 – 2000,Charts and tables from SP 16, Steel Tables & IS 800-2007 are permitted)

PART A:

Detailed design and drawing of the following concrete structures:

1. Typical building floors consisting of beam and slab using BIS code
2. Isolated footings and combined footings (Rectangular & Trapezoidal)
3. RCC cantilever and counter fort type retaining walls
4. Water tanks resting on ground level and underground tanks

PART B:

Detailed design and drawing of the following steel structures:

1. Bolted and welded Beam to Column Connection
2. Design of built-up Columns with base plate
3. Welded plate girder
4. Gantry girder
5. Simple trusses with connections.

TOTAL: 45 Hours

QUESTION PAPER PATTERN:

Question paper shall consist of two questions from each part and the students have to answer one question from each part. Part A consists of 60 marks and part B consists of 40marks.

OUTCOME :

At the end of the course the student acquires hands on experience in design and preparation of structural drawings for concrete / steel structures normally encountered in Civil Engineering practice.

TEXT BOOKS:

1. Krishna Raju, *Structural Design & Drawing (Concrete & Steel)*, CBS Publishers, 2007.

REFERENCES:

1. Krishnamurthy, D., *Structural Design & Drawing – Vol. II*, CBS Publishers & Distributors, Delhi.
2. Krishnamurthy, D., *Structural Design & Drawing – Vol*. III Steel Structures, CBS Publishers & Distributors, New Delhi
3. Punmia B.C., Ashok Kumar Jain, Arun Kumar Jain, *Design of steel structures*, Laxmi publications Pvt. Ltd, 2006.
4. *IS 456:2000 Plain and Reinforced concrete Code of practice* (Third Revision)
5. *SP :16 Design aids for Reinforced Concrete to IS 456-1978*.
6. *SP : 34 – 1987 Hand book on Concrete Reinforcement and Detailing*
7. *IS 3370:1967 Code of practicefor Concrete Structures for Storage of liquids* (Part – I, II, III & IV)
8. *IS 800:2007 Code of practice for general construction steel*
9. *SP 6 IS Structural steel Design Illustrated Hand book*
10. *IS 875:1987 & 2015 Code of practice for Design loads (other than earthquake) for buildings and structures (Part – I) Dead loads (Part – II) Live loads (Part – III) Wind loads*

22PTCE801 ECONOMICS AND MANAGEMENT 3 0 0 3

OBJECTIVE

The main objective of this course is to make the Civil Engineering student to know about the basic law of economics, how to organise a business, the financial aspects related to business, different methods of appraisal of projects, pricing techniques and decision making processes.

UNIT – I: BASIC ECONOMICS 9

Definition of economics - nature and scope of economic science - nature and scope of managerial economics - basic terms and concepts - goods - utility - value - wealth - factors of production - land - its peculiarities - labour - economies of large and small scale - consumption - wants - its characteristics and classification - law of diminishing marginal utility - relation between economic decision and technical decision - Demand - demand schedule - demand curve - law of demand - elasticity of demand - types of elasticity - factors determining elasticity - measurement - its significance - supply - supply schedule - supply curve - law of supply - elasticity of supply - time element in the determination of value.

UNIT – II: FINANCING 9

Types of financing - Short term borrowing - Long term borrowing - Internal generation of funds - External commercial borrowings - Assistance from government budgeting support and international finance corporations - Analysis of financial statement – Balance Sheet - Profit and Loss account - Funds flow statement - market price and normal price - money and banking - banking - kinds - commercial banks - central banking functions - control of credit - monetary policy.

UNIT – III: ORGANISATION 9

Forms of business - proprietorship - partnership - joint stock company - cooperative organisation - state enterprise - mixed economy - credit instrument - perfect competition - monopoly - monopolistic competition – oligopoly – duopoly.

UNIT-IV: MANAGEMENT 9

Management – nature – scope – functions – Scientific management theories – Organising – nature - process – purpose – types – organizational charts – organisation structure – Human resources planning – Training and Development – Directing – nature – scope – Creativity and innovation – Motivation and motivational theories – Leadership – types, styles – qualities – theories - Communication – communication function – process- network, barriers and rules – Controlling – characteristics – Budgetary and Non – budgetary control techniques – Product types – developments and analysis - Reporting

UNIT – V: COST AND BREAK EVEN ANALYSIS 9

Types of costing – traditional costing approach - activity base costing - Fixed Cost – variable cost – marginal cost – cost output relationship in the short run and in long run – pricing practice – full cost pricing – Break even analysis - Basic assumptions – break even point and its determination - break even chart – Applications of break even analysis in economics and managerial uses.

TOTAL : 45 Hours

OUTCOME :

On completion of the course, the students will be able to:

- analyze the framework of a business organization
- adopt an empirical approach toward business situations
- apply various Project Management techniques
- implement roles of team players
- Different costing methods.

TEXT BOOKS

1. Dewett K.K. & Varma J.D., *Elementary Economic Theory,* S Chand
2. Prasad L.M., *Principles and Practice of Management,* S Chand & Sons, 2010

REFERENCES

1. Barthwal R.R., *Industrial Economics - An IntroductoryText Book*, New Age
2. Khan M.Y. and Jain P.K.,*Financial Management*, McGraw-Hill Publishing Co., Ltd
3. Varshney R.L. and Maheshwary K.L., *Managerial Economics*, S Chand and Co
4. Harold Koontz & Heinz Weihrich, *Essentials of Management*, T.M.H. Publications, 2007
5. Tripathy P.C. & Reddy P.N., *Principles of Management*, T.M.H. Publications, 2007

22PTCE802	PROJECT WORK	0	0	9	6

OBJECTIVE

To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepare a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 180 PERIODS

OUTCOME:

On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

Professional Electives (PE)

22PTCEE01 IRRIGATION ENGINEERING 3 0 0 3

OBJECTIVE

The main objective of this course is to impart basic knowledge in Irrigation Engineering and Water Management.

UNIT–I: INTRODUCTION 9

Need, advantages and disadvantages of Irrigation - Environmental effects - Types of Irrigation systems - Gravity irrigation, canals, Tanks, Wells and Irrigation galleries - Water lifts. Soil -water - plant relationship: Soil and its function - Physical properties of soil and their importance in relation to irrigation - Classes and availability of soil water - Movement of water in soils - Measurement of soil moisture - Crop growth and moisture relationship - Salt problems in soil and effect of salts on plant growth.

UNIT – II: IRRIGATION REQUIREMENT 9

Evaporation, Evapo transpiration, Consumptive use and its estimation - Crop factor - Lysimeters - Effective rain fall and irrigation requirements - Water requirements of various crops - Duty of water - Quality of irrigation water.

UNIT – III: METHODS OF IRRIGATION 9

Surface, subsurface and overhead methods - Check basin, border & furrow, Drip and sprinkler irrigation - Irrigation efficiency, Depth, Rate and frequency of irrigation - Irrigation schedule.

UNIT – IV: DESIGN OF CHANNELS 9

Design of unlined and lined channels for irrigation - Location and design of canal regulation structures - Cross drainage structures - Measuring devices.

UNIT–V: LAND DEVELOPMENT AND IRRIGATION MANAGEMENT 9

Reclamation and management of saline and alkaline soils, water logging, Causes and remedial measures - Design, construction and maintenance of drainage systems.

Management of irrigation system - water charge assessment and water use management.

Total: 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Assess the irrigation needs of crops
- Design weirs on pervious foundation
- Design gravity dam and earthen dam
- Design the canal systems
- Select and design canal fall

TEXT BOOKS:

1. Punmia B.C.and Lal ,B.B., *Irrigation and Water Power Engineering,* Standard Publishers & Distributors, New Delhi, 2006.
2. Sharma R.K., and Sharma. T.K., *Irrigation Engineering* , S.Chand & Company Ltd, New Delhi, 2007.
3. Sahasra Budhe,Irrigation Engineering and Hydraulic Structures, S.K.Kataria & Sons, NewDelhi-110002;2012

REFERENCES:

1. A.M.Michael, *Irrigation Theory and Practice*, Vikas Publishing House Pvt. Ltd., 2004.
2. Hansen V.E., et.al., *Irrigation Principles and Practices*, John Wiley & Sons, 2001.
3. Sharma R.K., *Text Book of Irrigation Engineering and Hydraulic Structures*, Oxford & IBH Publishing Co., 2007.
4. Michael A.M., *Irrigation Theory and Practice*, Vikas Publishing House, New Delhi, 2004.
5. Das M.M, Saikia, M.S *Irrigation and water power Engineering*, PHI, Learning, (P) Ltd, New Delhi

22PTCEE02 WATER SHED MANAGEMENT 3 0 0 3

OBJECTIVE

The main objective of this course is to impart basic knowledge in Irrigation Engineering and Water Management.

- Identify the causes of soil erosion
- conservation measures in a watershed
- water harvesting and groundwater recharging structures
- reclamation of saline soils

UNIT – I: INTRODUCTION 9

Introduction, concept of watershed, need for watershed management, concept of sustainable development.

UNIT – II :WATER SHED CONCEPTS 9

Hydrology of small watersheds – Determination of Runoff – Emperical formulae – Flood estimation by Dicken's formula – Watershed Management.

UNIT – III: METHODS OF IRRIGATION 9

Principles of soil erosion, causes of soil erosion, types of soil erosion, estimation of soil erosion from small watersheds – prevention of soil erosion.

UNIT – IV: DESIGN OF CHANNELS 9

Control of soil erosion, methods of soil conservation – structural and non-structural measures.
Principles of water harvesting, methods of rainwater harvesting, design of rainwater harvesting structures.
.

UNIT – V: LAND DEVELOPMENT AND IRRIGATION MANAGEMENT 9

Artificial recharge of groundwater in small watersheds, methods of artificial recharge.
Reclamation of saline soils. Micro farming, biomass management on the farm.

Total: 45 Hours

OUTCOME :

At the end of the course, the student will be able to :

- Demonstrate the causes of soil erosion
- Carry out conservation measures in a watershed
- Know about water harvesting and groundwater recharging structures

TEXT BOOKS:

1. Chatterjee, S. N., Water Resources Conservation and Management, Atlantic Publishers, 2008.
2. Murthy, V.V.N., Land and Water Management, Khalyani Publishers, 2004.

REFERENCES:

1. Muthy, J. V. S., Watershed Management, New Age International Publishers, 1998.
2. Suresh Rao, Soil and Water Conservation Practices, Standard Publishers, 1998.

22PTCEE03 GROUND WATER ENGINEERING 3 0 0 3

OBJECTIVE:

To impart knowledge on occurrence, distribution, exploration and development of groundwater resources

UNIT – I: FUNDAMENTALS OF GROUNDWATER 9

Introduction – Groundwater in Hydrologic cycle - Vertical distribution of groundwater – Porosity and types – Permeability - Laboratory permeability tests - Aquifers and types – Confined; Unconfined and Semi-confined – Springs and types.

UNIT – II: GROUNDWATER FLOW AND WELL HYDRAULICS 9

Darcy's Law – Specific yield – Specific retention - Storage coefficient – Transmissivity – General groundwater floe equations – Steady and unsteady flow – Steady unidirectional flow in confined and unconfined aquifers – Steady radial flow in confined and unconfined aquifers – Unsteady radial flow in confined aquifer – Theis Method - Dupuit Forchheimer assumptions- Jacob method- Recovery test

UNIT – III: GROUNDWATER EXPLORATION 9

Introduction to geophysical methods – Electrical resistivity methods –Seismic Reflection and Refraction Methods – Remote sensing techniques for groundwater exploration – Well logging and types - Collector wells and Infiltration galleries

UNIT – IV: GROUNDWATER QUALITY 9

Chemistry of groundwater – Major ions and Trace elements in groundwater – Drinking water quality – BIS and WHO Standards - Classification of groundwater based on Hardness and TDS – Irrigation water quality – Salinity and alkalinity hazard –Water quality representation diagrams - Sea water intrusion-causes and control

UNIT – V: GROUNDWATER DEVELOPMENT 9

Watershed management - Conjunctive use - Artificial recharge of groundwater – Small scale and Large scale rain water harvesting techniques – Case studies

TOTAL: 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Identify types of aquifers
- Carry out surface and subsurface investigation to locate groundwater
- Visualize the occurrence and movement of groundwater
- Select suitable type of ground water recharge
- Assess sea water intrusion and its control

TEXT BOOKS:

1. David Keith Todd. Groundwater Hydrology, John Wiley & Sons, Inc, New York,1980.
2. Raghunath H.M. Ground Water, New Age International Publishers, New Delhi, Second Edition,1998.

REFERENCES:

1. Freeze R.A, Cherry J.A. Groundwater, Prentice Hall, Englewood Cliffs, New Jersey, 1979.
2. Karanth K.R. Groundwater Assessment, Development and Management, Tata McGraw Hill, New Delhi, 1987.
3. Ramakrishnan S. Ground Water, TNHB Colony, Chennai, First Edition, 1998.

22PTCEE04 HYDROLOGY 3 0 0 3

OBJECTIVE

At the end of the semester, the student shall be having a good understanding of all the components of the hydrological cycle. The mechanics of rainfall, its spatial and temporal measurement and their applications will be understood. Simple statistical analysis and application of probability distribution of rainfall and run off shall also be understood. Student will also learn simple methods of flood routing and basics of ground water hydrology.

UNIT – I: PRECIPITATION 9

Hydrologic cycle – Types of precipitation – Forms of precipitation – Measurement of Rainfall – Spatial measurement methods – Temporal measurement methods – Frequency analysis of point rainfall – Intensity, duration, frequency relationship – Probable maximum precipitation.

UNIT – II :ABSTRACTION FROM PRECIPITATION 9

Losses from precipitation – Evaporation process – Reservoir evaporation – Infiltration process – Infiltration capacity – Measurement of infiltration – Infiltration indices – Effective rainfall.

UNIT – III :HYDROGRAPHS 9

Factors affecting Hydrograph – Base flow separation – Unit hydrograph – Derivation of unit hydrograph – S curve hydrograph – Unit hydrograph of different durations - Synthetic Unit Hydrograph

UNIT – IV: FLOODS AND FLOOD ROUTING 9

Flood frequency studies – Recurrence interval – Gumbel's method – Flood routing – Reservoir flood routing – Muskingum's Channel Routing – Flood control

UNIT – V: GROUND WATER HYDROLOGY 9

Types of aquifers – Darcy's law – Dupuit's assumptions – Confined Aquifer – Unconfined Aquifer – Recuperation test – Transmissibility – Specific capacity – Pumping test – Steady flow analysis only.

TOTAL: 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Demonstrate the concepts of hydrograph, S-hydrograph, Unit hydrograph and IUH
- Estimate the hydrological parameters
- Carry out statistical and probability analysis of hydrological data
- Demonstrate the concepts of hydrological systems
- Develop regression models for the analysis of hydrological data

TEXT BOOKS:

1. Chow V.T. and Maidment, Hydrology for Engineers, McGraw-Hill Inc., Ltd., 2000
2. Subramanya K., Engineering Hydrology, Tata McGraw-Hill Publishing Co., Ltd., 2000
3. Raghunath H.M., Hydrology, Wiley Eastern Ltd., 2000

REFERENCES:

1. Singh V.P., Hydrology, McGraw-Hill Inc., Ltd., 2000
2. Jaya Rami Reddy P., A text book of Hydrology, Laxmi Publications Pvt Ltd.,2008
3.Patra K.C.Hydrology and Water resources Engineering, Narosa publishing house, Newdelhi-2006
4.Ghanashyam Das. Hydrology and Soil Conservation Engineering, Prentice-Hall India, Newdelhi-2000

22PTCEE05 COASTAL ENGINEERING 3 0 0 3

OBJECTIVE

The main objective of this course is to impart basic knowledge in coastal and offshore structures. Also to introduce fundamental concepts of planning and design of these structures.

UNIT – : GROWTH AND REGULATION OF PORTS 9

History of Port – Classification of Harbours –Harbours in India - Factors affecting the growth of Port - Requirement of a Harbour - General Planning - Site investigation Description of selected Indian ports.

UNIT – II: HARBOUR PLANNING (TECHNICAL) 9

Harbour entrance - Navigational Channel – Depth of harbour – Turning basin – berthing area – Shipping terminal facilities – Essentials of passenger terminal, dry bulk cargo terminal, Liquid bulk cargo terminals and container terminals. Navigational aids – Light house.

UNIT – III: BREAK WATERS 9

Types – Selection – Forces and – Design principles of break waters. Berthing structures: Types – Loads – Selection and design principles of berthing structures – Selection and Design principles of Dock fenders and Mooring accessories. Types of dock structures, Dredging.

UNIT – IV: OFFSHORE STRUCTURES 9

Types of offshore structures – selection – function - Physical, environmental and geotechnical aspects of marine and offshore construction – Loads and responses of offshore structures.

UNIT – V: FOUNDATIONS FOR OFFSHORE STRUCTURES 9

Introduction to design and installation of offshore piled platforms, concrete offshore platforms, Moored floating structures and Submarine pipelines.

TOTAL : 45 Hours

OUTCOME :

At the end of the course, the student will be able to have knowledge on

- growth and regulation of ports, harbor
- Design principles of break water planning and offshore structures
- Significance of submarine pipelines

TEXT BOOKS:

1. Gerwick Ben C. , *Construction of Marine and Offshore structures* (ISBN 0 -8493-7485-5), CRC Press.
2. Alonzo Def. Quinn., *Design and construction of Port and Marine structures* (ISBN 71-14899407-051064-40) Mc Graw Hill book co.

REFERENCES:

1. Subrata K. Chakrabarti., *Hand book of offshore engineering* (Vol 1 & 2) (ISBN-13:
978-0-08-044381-2 (set)) Elsevier publications

22PTCEE06 GROUND IMPROVEMENT TECHNIQUES 3 0 0 3

OBJECTIVE

At the end of the course, the student is expected to identify basic deficiencies of various soil deposits and decide various ways and means of implementing techniques of improvement of soil characteristics.

UNIT – I: INTRODUCTION 9

Role of ground improvement in foundation engineering - methods of ground improvement – Geotechnical problems in alluvial, laterite and black cotton soils - Selection of suitable ground improvement techniques based on soil condition.

UNIT – II: DRAINAGE AND DEWATERING 9

Drainage techniques - Well points - Vacuum and electro-osmotic methods - Seepage analysis for two dimensional flow-fully and partially penetrating slots in homogeneous deposits (Simple cases only).

UNIT – III: INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS 9

In-situ densification of cohesionless and consolidation of cohesive soils -Dynamic compaction and consolidation – Vibro-flotation - Sand pile compaction - Preloading with sand drains and fabric drains – Stone columns – Lime piles - Installation techniques only - relative merits of various methods and their limitations.

UNIT – IV: EARTH REINFORCEMENT 9

Concept of reinforcement - Types of reinforcement material - Applications of reinforced earth – use of Geotextiles for filtration, drainage and separation in road and other works.

UNIT – V: GROUT TECHNIQUES 9

Types of grouts - Grouting equipment and machinery - Injection methods - Grout monitoring – Stabilisation with cement, lime and chemicals - Stabilisation of expansive soils. **TOTAL : 45Hours**

OUTCOME :

At the end of the course, the student will be able to:

- Demonstrate the various ground improvement techniques
- Carry out insitu treatment of cohesionless and cohesive soils
- Apply the geotextile material in practice
- Know the grouting equipment and monitoring

TEXT BOOKS:

1. Purushothama Raj P., Ground Improvement Techniques, Tata McGraw-Hill Publishing Company, New Delhi, 1995
2. Koerner R.M., Construction and Geotechnical Methods in Foundation Engineering, McGraw-Hill, 1994.
3. Moseley M.P., Ground Improvement , Blackie Academic and Professional, Chapman and Hall, Glasgow, 1993.

REFERENCES:

1. Jones J.E.P., Earth Reinforcement and Soil Structure, Butterworths, 1995.
2. Koerner R.M., Design with Geosynthetics, (3rd Edition) Prentice Hall, New Jersey, 2002
3. Jewell R.A., Soil Reinforcement with Geotextiles, CIRIA special publication, London, 1996
4. Das B.M., Principles of Foundation Engineering, Thomson Books / Cole, 2003.

22PTCEE07 INTRODUCTION TO SOIL DYNAMICS AND MACHINE FOUNDATION 3 0 0 3

OBJECTIVE

At the end of this program the, student is expected to assess the dynamic properties of soil and various design parameters required for the design of machine foundation as well as design of foundation for various reciprocating machines.

UNIT – I: INTRODUCTION 9

Vibration of elementary systems-vibratory motion-single degree freedom system-free and forced vibration with and without damping.

UNIT – II: WAVES AND WAVE PROPAGATION 9

Wave propagation in an elastic homogeneous isotropic medium- Raleigh, shear and compression waves-waves in elastic half space.

UNIT – III: DYNAMIC PROPERTIES OF SOILS 9

Elastic properties of soils-coefficient of elastic, uniform and non-uniform compression - shear-effect of vibration dissipative properties of soils-determination of dynamic properties of soil- codal provisions.

UNIT – IV: DESIGN PROCEDURES 9

Design criteria -dynamic loads - simple design procedures for foundations under reciprocating machines - machines producing impact loads - rotary type machines.

UNIT – : VIBRATION ISOLATION 9

Vibration isolation technique-mechanical isolation-foundation isolation-isolation by location-isolation by barriers- active passive isolation tests.

TOTAL : 45Hours

OUTCOME :

At the end of the course, the student will be able to:

- Assess dynamic properties of soil
- Demonstrate various Vibration isolation technique
- Design machine foundation

TEXT BOOKS:

1. Swamisaran, “Soil Dynamics and Machine Foundations”, Galgotia Publications
Pvt.Ltd.,1999.
2. S.Prakesh & V.K Puri, Foundation for machines, McGraw-Hill 1993
3. Srinivasulu, P & Vaidyanathan, Hand book of Machine Foundations, McGraw-Hill,
1996.
4. Kramar S.L, “Geotechnical Earthquake Engineering”, Prentice Hall International
series, Pearson Education (Singapore) Pvt. Ltd.
5. Kameswara Rao, “Dynamics Soil Tests and Applications”, Wheeler Publishing, New
Delhi, 2003

REFERENCES:

1. Kameswara Rao, “Vibration Analysis and Foundation Dynamics”, Wheeler Publishing, New Delhi, 1998
2. IS code of Practice for Design and Construction of Machine Foundations, McGraw-Hill, 1996.
3. Moore P.J., “Analysis and Design of Foundation for Vibration”, Oxford and IBH, 1995.

22PTCEE08 SOIL STRUCTURE INTERACTION 3 0 0 3

OBJECTIVE

To understand the mechanism of soils, their interactive behaviour, analysis, its influences in the design parameters through design charts and software packages.

UNIT – I : SOIL-FOUNDATION INTERACTION 9

Introduction to soil - Foundation interaction problems, Soil behaviour, Foundation behaviour, Interface, behaviour, Scope of soil-foundation interaction analysis, soil response models, Winkler, Elastic continuum, Two parameter elastic models, Elastic plastic behaviour, Time dependent behaviour.

UNIT – II : BEAM ON ELASTIC FOUNDATION - SOIL MODELS 9

Infinite beam, Two parameters, Isotropic elastic half space, Analysis of beams of finite length, Classification of finite beams in relation to their stiffness.

UNIT – III : PLATE ON ELASTIC MEDIUM 9

Infinite plate, Winkler, Two parameters, Isotropic elastic medium, Thin and thick plates, Analysis of finite plates, rectangular and circular plates, Numerical analysis of finite plates, simple solutions.

UNIT – IV : ELASTIC ANALYSIS OF PILE 9

Elastic analysis of single pile, Theoretical solutions for settlement and load distribution, Analysis of pile group, Interaction analysis, Load distribution in groups with rigid cap.

UNIT – V : LATERALLY LOADED PILE 9

Load deflection prediction for laterally loaded piles, subgrade reaction and elastic analysis, Interaction analysis, and pile raft system, solutions through influence charts.

TOTAL : 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Know about soil response models
- Analyze beams of finite length
- Know about numerical analysis of finite plate and elastic analysis of pile

TEXT BOOKS:

1. Saran, S, Analysis and desaign of substructures, Taylor & Francis Publishers, 2006 2. Hemsley, J.A, Elastic Analysis of Raft Foundations, Thomas Telford, 1998.

3. McCarthy, D.F. Essentials of Soil Mechanics and Foundations, basic geotechnics (6th Edition), Prentice Hall, 2002.

4. Selvadurai, A.P.S., Elastic Analysis of Soil Foundation Interaction, Elsevier, 1979.

5. Poulos, H.G., and Davis, E.H., Pile Foundation Analysis and Design, John Wiley, 1980.

6. Bowels J.E., "Analytical and Computer Methods in Foundation", McGraw Hill Book Co. New York.

REFERENCES:

1. Scott, R.F. Foundation Analysis, Prentice Hall, 1981.

2. Structure Soil Interaction - State of Art Report, Institution of structural Engineers, 1978.

3. ACI 336, Suggested Analysis and Design Procedures for Combined Footings and Mats, American Concrete Institute, Dehit, 1988.

22PTCEE09 REINFORCED SOIL STRUCTURES 3 0 0 3

OBJECTIVE

At the end of the course, the student is expected to identify basic deficiencies of various soil deposits and decide various ways and means of implementing techniques of improvement of soil characteristics .

UNIT – I : PRINCIPLES AND MECHANISMS 9

Historical Background, Principles, Concepts and Mechanisms of reinforced earth.

UNIT – II : MATERIALS 9

Materials used in reinforced soil structures, fill materials, reinforcing materials metal strips, Geotextile, Geogrids, Geomembranes, Geocomposites and Geojutes, Geofoam, Natural fibers - facing elements.

UNIT – III : DESIGN ASPECTS AND APPLICATION 9

Design aspects of reinforced earth. Design and applications of reinforced earth of various structures, like retaining walls, foundations, pavements, embankments and slopes - drains - liners for liquid containment.

UNIT – IV : DURABILITY OF REINFORCEMENT MATERIALS 9

Measurement of corrosion factors, resistivity - redox potential, water content, pH, electrochemical corrosion, bacterial corrosion.

UNIT – V : CASE HISTORIES AND APPLICATIONS 9

Performance studies of reinforced dams, embankments, pavements, railroads, foundations and underground structure - case studies.

TOTAL : 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Demonstrate the mechanisms of reinforced earth
- Know about materials used in reinforced soil structures
- Demonstrate the design aspects of reinforced earth anddurability of reinforcement materials

TEXT BOOKS:

1. Jewell, R.A., Soil Reinforcement with Geotextile, CIRIA, London, 1996.

2. John, N.W.M., Geotextiles, John Blackie and Sons Ltd., London, 1987.

3. Jones, C.J.F.P., Earth Reinforcement and Soil Structures, Earthworks, London, 1982.

4. Koerner, R.M., Designing with Geosynthetics, (Third Edition), Prentice Hell, 1997.

REFERENCES:

1. Proc. Conference on polymer and Reinforcement, Thomas Telford Co., London, 1984.
2. John S. Horvath, GeofoamGeosynthetic, Horvath Engineering P.C. Scarsdale, New
York, U.S.A, 1998.
3. Gray, D.H., and Sotir, R.B., Biotechnical and Soil Engineering Slope Stabilization: A
practical Guide for Erosion control, John Wiley & Son Inc., New York, 1996.

4. RamanathaAyyar ,T.S., Ramachandran Nair, C.G. and Balakrishna Nair, N., comprehensive reference book on Coir Geotextile, centre for Development for Coir
Technology, 2002.

22PTCEE10 SUBSURFACE INVESTIGATION AND INSTRUMENTATION 3 0 0 3

OBJECTIVE

Students are expected to understand the importance of site investigation, planning of sub soil investigation, interpretation of investigated data to design suitable foundation system.

UNIT – I : SCOPE AND OBJECTIVES OF EXPLORATION 9

Scope and objectives, planning and exploration program, methods of exploration, exploration for preliminary and detailed design, spacing and depth of bores, data presentation. Geophysical exploration and interpretation, seismic and electrical methods.

UNIT – II : EXPLORATION TECHNIQUES 9

Methods of boring and drilling, non-displacement and displacement methods, drilling in difficult subsoil conditions, stabilization of boreholes, bore logs.

UNIT – III : SOIL SAMPLING 9

Sampling, disturbed and undisturbed soil sampling advanced sampling techniques, offshore sampling, shallow penetration samplers, preservation and handling of samples.

UNIT – IV : FIELD TESTING IN SOIL EXPLORATION 9

Field tests, penetration tests, procedures and methods, data interpretation, Field vane shear, Insitu shear and bore hole shear test, pressuremeter test, utility, correction and data interpretation, plate load test–monotonic and cyclic; field permeability test.

UNIT – V : INSTRUMENTATION 9

Instrumentation in soil engineering, strain gauges, resistance and inductance type, load cells, earth pressure cells, settlement and heave gauges, piezometers and slope indicators, inclinometer, case studies.

TOTAL : 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Know about bore log details
- Demonstrate geophysical exploration and various exploration techniques
- Know about various sampling techniques
- Know about various field test and various instrumentation

TEXT BOOKS:

1. Hunt, R.E., Geotechnical Engineering Investigation Manual, McGraw Hill, 1984

2. Winterkorn, H.F. and Fang, H.Y., Foundation Engineering Hand Book, a Nostrand
Reinhold 1994.

3. Alam Singh and Chowdhary, G.R., Soil Engineering in Theory and Practice, Volume-
2, Geotechnical testing and instrumentation, CBS Publishers and Distributors, New
Delhi, 2006.

REFERENCES:

1. Nair, R.J. and Wood, P.M., Pressuremeter Testing Methods and Interpretation, Butter-worths, 1987.
2. Dunnicliff, J., and Green, G.E., Geotechnical Instrumentation for Monitoring Field
Performance, John Wiley, 1993.
3. Day, R.N., Geotechnical and Foundation Engineering, Design and Construction, McGraw-Hill, 1999.

22PTCEE11 ADVANCED SURVEYING TECHNIQUES 3 0 0 3

OBJECTIVE

At the end of the course the student will posses knowledge about advanced techniques in surveying.

UNIT – I : BASICS OF SURVEYING 9

Methods of measuring distance, historical development, basic principles, classifications, applications and comparison with conventional surveying.

UNIT – II : FUNDAMENTALS OF ELECTRONICS 9

Fundamentals of electronics, resonant circuits, semiconductors, Lasers, Cathode ray tube, photo multiplier tube, transducers, oscillators, frequency mixing, modulation and demodulation, Kerrcell modulator, measurement of phase difference, reflectors and power sources.

UNIT – III : PROPAGATION OF ELECTROMAGNETIC WAVES 9

Definition, classification, applications, propagation properties, wave propagation at lower and higher frequencies. Refractive index, factors affecting, computation of group refractive index for light and near infrared waves at standard conditions and ambient conditions, reference refractive index.

UNIT – IV : ELECTROMAGNETIC DISTANCE MEASURING SYSTEM 9

Electro-optical system, measuring principle, working principle, sources of error, infrared EDM instruments, Laser EDM instruments and total station. Microwave system, measuring principle, working principle, sources of error, microwave EDM instruments, comparison with Electro-optical system.

UNIT – V : MODERN EQUIPMENTS 9

Total Station-Applications In various fields-Global positioning system-Introduction, Principles, Applications.

TOTAL : 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Apply advanced surveying techniques in different fields of civil engineering
- Select the advanced surveying technique which is best suited for a work
- Apply total station and EDM in distance measurement and traversing
- Demonstrate the principles of the earth surface, its projections and different coordinates involved in map making
- Apply GPS in transportation engineering, structural engineering and land use planning

TEXT BOOKS:

1. Burnside, C.D. *Electromagnetic distance measurement* Crosby Lock wood staples,
U.K. 1971.

REFERENCES:

1. Rueger, J.M. *Electronic Distance Measurement*, Springer-Verlag, Berlin, 1990.
2. Laurila, S.H. *Electronic Surveying in Practice*, John Wiley and Sons Inc, 1983.
3. Soastamoinen, J.J. Surveyor's guide to electro-magnetic Distance Measurement, Adam Hilger
Ltd., 1967.

22PTCEE12 TRAFFIC ENGINEERING 3 0 0 3

OBJECTIVE

The students acquire comprehensive knowledge of traffic surveys and studies such as 'Volume Count', 'Speed and delay', 'Origin and destination', 'Parking', 'Pedestrian' and 'Accident surveys'. They achieve knowledge on design of 'at grade' and 'grade separated' intersections. They also become familiar with various traffic control and traffic management measures.

UNIT – I : INTRODUCTION 9

Significance and scope, Characteristics of Vehicles and Road Users, Skid Resistance and Braking Efficiency (Problems), Components of Traffic Engineering- Road, Traffic and Land Use Characteristics

UNIT – II : TRAFFIC SURVEYS AND ANALYSIS 9

Surveys and Analysis - Volume, Capacity, Speed and Delays, Origin and Destination, Parking, Pedestrian Studies, Accident Studies and Safety Level of Services- Problems

UNIT – III : TRAFFIC CONTROL 9

Traffic signs, Road markings, Design of Traffic signals and Signal co-ordination (Problems), Traffic control aids and Street furniture, Street Lighting, Computer applications in Signal design

UNIT – IV : GEOMETRIC DESIGN OF INTERSECTIONS 9

Conflicts at Intersections, Classification of Intersections at Grade, - Chanallised and Unchanallised Intersection - Grade Separators (Concepts only), Principles of Intersection Design, Elements of Intersection Design, Chanallisation and Rotary design (Problems), Grade Separators

UNIT – V : TRAFFIC MANAGEMENT 9

Traffic Management- Traffic System Management (TSM) and Travel Demand Management (TDM), Traffic Forecasting techniques, Restrictions on turning movements, One-way Streets, Traffic Segregation, Traffic Calming, Tidal flow operations, Exclusive Bus Lanes - Introduction to Intelligence Transport System (ITS)

TOTAL:45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- apply the principles of the transportation planning process and demand estimation
- analyse the trip production and trip attraction models
- analyse the growth factor, gravity and opportunity models
- apply the mode choice behaviour and mode split models
- apply the shortest path models for route assignment

TEXT BOOKS:

1. Khanna K., Justo C E G., *Highway Engineering*, Khanna Publishers, Roorkee, 2001.
2. Kadiyali L R, *Traffic Engineering and Transport Planning*, Khanna Technical Publications, Delhi, 2000.

REFERENCES:

1. Subhash C.Saxena, A Course in Traffic Planning and Design, Dhanpat Rai Publications, New Delhi, 1989.
2. Saltar S.A., Highway Traffic Analysis and Design, Prentice Hall, New Jersey, 2002.
3. Guidelines of Ministry of Road Transport and Highways, Government of India.
4. Indian Roads Congress (IRC) specifications: Guidelines and special publications on

Traffic Planning and Management

22PTCEE13 AIRPORTS, DOCKS AND HARBOURS ENGINEERING 3 0 0 3

OBJECTIVE

The course imparts the knowledge of planning, design, construction and maintenance of airports, docks and harbour structure

UNIT – I : AIRPORT PLANNING AND DESIGN 9

Advantages and Limitations of Air Transport, Components of Airports-Airport Planning – Air traffic potential, Site Selection, Design of Components, Cost Estimates, Evaluation and Institutional arrangements-Runway Design- Orientation, Cross wind Component, Wind rose Diagram (Problems), Geometric Design and Corrections for Gradients (Problems), Drainage.

UNIT – II : TAXIWAY DESIGN AND AIRPORT LAYOUTS 9

Taxiway Design – Geometric Design Elements, Minimum Separation Distances, Design Speed, Airport Drainage -Airport Zoning - Clear Zone, Approach Zone, Buffer Zone, Turning Zone, Clearance over Highways and Railways-Airport Layouts – Apron, Terminal Building, Hangars, Motor Vehicle Parking Area and Circulation Pattern, Case studies of Airport Layouts-Airport Buildings – Primary functions, Planning Concept, Principles of Passenger Flow, Passenger Facilities.

UNIT – III : VISUAL AIDS AND AIR TRAFFIC CONTROL 9

Visual Aids – Runway and Taxiway Markings, Wind Direction Indicators, Runway and Taxiway Lightings-Air Traffic Control – Basic Actions, Air Traffic Control Network Helipads, Hangars, Service Equipments.

UNIT – IV : HARBOUR ENGINEERING 9

Definition of Terms - Harbours, Ports, Docks, Tides and Waves, Littoral Drift, Sounding, Area, Depth, Satellite Ports Requirements and Classification of Harbours

Site Selection & Selection Investigation – Speed of water, Dredging, Range of Tides, Waves and Tidal Currents, Littoral Transport with Erosion and Deposition, Anchoring Grounds, Geological Characteristics, Winds & Storms- Proximity to Towns/Cities, Utilities, Construction Materials, Coast Lines.

UNIT – V : DOCKS AND OTHER STRUCTURES 9

Dry and Wet Docks,, Planning and Layouts- Entrance, Position of Light Houses, Navigating Terminal Facilities – Port Buildings, Warehouse, Transit Sheds, Inter-modal Transfer Facilities, Navigational Aids Coastal Structures- Piers, Breakwaters, Wharves, Jetties, Quays, Spring Fenders Coastal Shipping, Inland Water Transport and Container Transportation. Pipe Ways, Rope Ways.

TOTAL: 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Plan for airport, harbour, docks and coastal structures
- Design for airport and its components
- Construct airport, docks and harbour
- Protect the harbour, docks and coastal structures

TEXT BOOKS:

1. Khanna S.K, Arora M.G, *Airport Planning and Design*, Nemchand And Brothers,
Roorkee, 2007.
2. Bindra S P., *A Course in Docks and Harbour Engineering*, Dhanpat Rai and Sons,
New Delhi, 1993.
3. Vasirani V.N.and Chandola S.P., *Transportation and Engineering*, Vol.2 Khanna
Publishers, New Delhi

REFERENCES:

1. Shahani P.B., *Airport Techniques*, 2nd edition, Oxford Publications, New Delhi
2. Srinivasan R., *Harbour, Dock and Tunnel Engineering*, Chartor Publishing House, Anand,
India, 1995.

22PTCEE14 DESIGN OF BRIDGES 3 0 0 3

OBJECTIVE

At the end of this course the student shall be able to choose appropriate bridge structure and design it for given site conditions.

UNIT – I : INTRODUCTION 9

Design of through type steel highway bridges for IRC loading - Design of stringers, cross girders and main girders - Design of deck type steel highway bridges for IRC loading - Design of main girders

UNIT – II : STEEL BRIDGES 9

Design of Pratt type truss girder highway bridges - Design of top chord, bottom chord, web members - Effect of repeated loading - Design of plate girder railway bridges for railway loading - Wind effects - Design of web and flange plates - Vertical and horizontal stiffeners.

UNIT – III : REINFORCED CONCRETE SLAB BRIDGES 9

Design of solid slab bridges for IRC loading - Design of kerb - Design of Tee

beam bridges - Design of panel and cantilever for IRC loading

UNIT – IV : REINFORCED CONCRETE GIRDER BRIDGES 9

Design of Tee-beam - Courbon's theory - Pigeaud's curves - Design of balanced cantilever bridges - Deck slab - Main girder - Design of cantilever - Design of articulation.

UNIT – V : PRESTRESSED CONCRETE BRIDGES 9

Design of prestressed concrete bridges - Preliminary dimensions - Flexural and torsional parameters - Courbon's theory - Distribution coefficient by exact analysis - Design of girder section - Maximum and minimum prestressing forces - Eccentricity - Live load, dead load and shear forces - cable zone in girder –check for stresses at various sections - check for diagonal tension - diaphragms - end block - short term and long term deflections.

TOTAL : 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Design through type, pratt type, steel highway bridges
- Have a thorough knowledge of designing RCC t-beam and prestressed concrete bridges

TEXT BOOKS:

1. Johnson Victor D., Essentials of Bridge Engineering, Oxford and IBHPublishing
Co., New Delhi, 1990.
2. Ponnuswamy S., Bridge Engineering, Tata McGraw-Hill, New Delhi, 1996

REFERENCES:

1. Phatak D.R., Bridge Engineering, Satya Prakashan, New Delhi, 1990.

22PTCEE15 INTEGRATED TRAFFIC PLANNING AND MANAGEMENT 3 0 0 3

OBJECTIVE

To give an overview of Traffic engineering, traffic regulation, management and traffic safety with integrated approach in traffic planning as well.

UNIT – I : TRAFFIC PLANNING AND CHARACTERISTICS 9

Road Characteristics – Road user characteristics – PIEV theory – Vehicle – Performance characteristics – Fundamentals of Traffic Flow – Urban Traffic problems in India – Integrated planning of town ,country ,regional and all urban infrastructure – Towards Sustainable approach. – land use & transport and modal integration.

UNIT – II : TRAFFIC SURVEYS 9

Traffic Surveys – Speed, journey time and delay surveys – Vehicles Volume Survey including non-motorized transports – Methods and interpretation – Origin Destination Survey – Methods and presentation – Parking Survey – Accident analyses -Methods, interpretation and presentation – Statistical applications in traffic studies and traffic forecasting – Level of service – Concept, applications and significance.

UNIT – III : TRAFFIC DESIGN AND VISUAL AIDS 9

Intersection Design - channelization, Rotary intersection design – Signal design – Coordination of signals — Grade separation - Traffic signs including VMS and road markings – Significant roles of traffic control personnel - Networking pedestrian facilities & cycle tracks.

UNIT – IV : TRAFFIC SAFETY AND ENVIRONMENT 9

Road accidents – Causes, effect, prevention, and cost – Street lighting – Traffic and environment hazards – Air and Noise Pollution, causes, abatement measures – Promotion and integration of public transportation – Promotion of non-motorized transport.

UNIT – V : TRAFFIC MANAGEMENT 9

Area Traffic Management System - Traffic System Management (TSM) with IRC standards –- Traffic Regulatory Measures-Travel Demand Management (TDM) – Direct and indirect methods – Congestion and parking pricing – All segregation methods- Coordination among different agencies – Intelligent Transport System for traffic management, enforcement and education.

TOTAL : 45 Hours

OUTCOME:

On completing this course, the Students will be able to

- Analyse traffic problems and plan for traffic systems various uses
- Design Channels, Intersections, signals and parking arrangements
- Develop Traffic management Systems

TEXT BOOKS:

1. Kadiyali.L.R. "Traffic Engineering and Transport Planning", Khanna Publishers, Delhi, 2013
2. Indian Roads Congress (IRC) Specifications: Guidelines and Special Publications on Traffic Planning and Management.
3. Salter. R.I and Hounsell N.B, "Highway Traffic Analysis and design", Macmillan Press Ltd.1996.

REFERENCES:

1. Fred L. Mannering, Scott S. Washburn and Walter P.Kilareski, Principles of Highway Engineering and Traffic Analysis, Wiley India Pvt. Ltd., New Delhi, 2011
2. Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, New Delhi, 2010
3. SP:43-1994, IRC Specification, "Guidelines on Low-cost Traffic Management Techniques" for Urban Areas, 1994
4. John E Tyworth, "Traffic Management Planning, Operations and control", Addison Wesly Publishing Company, 1996
5. Hobbs.F.D. "Traffic Planning and Engineering", University of Brimingham, Peragamon Press Ltd, 2005
6. Taylor MAP and Young W, "Traffic Analysis – New Technology and New Solutions", Hargreen Publishing Company, 1998.

22PTCEE16 CONSTRUCTION TECHNIQUES AND EQUIPMENTS 3 0 0 3

OBJECTIVE

The main objective of this course is to impart basic knowledge in Construction methods, equipments, machineries and fire safety principles.

UNIT – I : MODERN CONSTRUCTION METHODS 9

Open excavation, shafts and tunnels, pier and caisson foundation . Basement construction - construction Methods – supporting the excavations- control of ground water-requirements of form work – economy in form work – materials for forms – arrangements forms for slabs, beams, columns, walls, culverts, stairs etc – removal of forms - shoring and underpinning- basement waterproofing.

UNIT – II : CONSTRUCTION TECHNIQUES 9

Construction Methods for Bridges, roads, railways, dams, harbours, river works and pipelines - Construction techniques for Earth moving, excavating , drilling, blasting, tunneling and hoisting and erection

UNIT – III : CONSTRUCTION EQUIPMENTS 9

Equipment for: Earth moving, excavating, drilling and blasting.
Equipment for: Dredging, tunneling, hoisting, erection and dewatering - Equipment for Flooring – dewatering and floors finishing.

Equipment for production of concrete – Crushers- feeders- screening equipment – batching and mixing equipment – Conveyors – Vibrators – Concrete mixers - hauling, pouring and pumping equipment – transporters.

UNIT – IV :MACHINERIES AND ELECTRICAL SYSTEMS IN BUILDINGS 9

Lifts and Escalators – Special features required for physically handicapped and elderly. Basics of electricity-Single/Three phase supply-Protective devices in electrical installations – Earthing for safety –Types of earthing – IS specifications-Planning electrical wiring for building-Main and distribution boards.

UNIT – V: ILLUMINATION & FIRE SAFETY 9

Luminous flux-Candela-Solid angle illumination-Utilisation factor-Depreciation factor-MSCP-MHCP- Lans of illumination-Classification of lighting- Artificial light sources-Spectral energy distribution-Luminous efficiency-Color temperature-Color rendering.

Design of modern lighting-Lighting for stores, offices, schools, hospital and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.
Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special features required for physically handicapped and elderly in building types – Heat and smoke detectors – Fire alarm system, snorkel ladder.

TOTAL : 45 Hours

OUTCOME :
At the end of the course, the student will be able to have knowledge in

- Construction methods, equipment and techniques
- Importance of electrical safety in buildings
- Princples on illumination and fire safety

TEXT BOOKS:

1. Antil J M., *Civil Engineering Construction*, McGraw Hill Book Co., 1982
2. Peurifoy, R.L.,Ledbette. W.B *Construction Planning , Equipment and Methods* McGraw Hill Co, 2000
3. Ratay., R.T Hand Book of *Temporary Structures in Construction*, McGraw Hill,1984

Ambrose E.R., *Heat Pumps and Electric Heating* , John Wiley and Sons,Inc.,New York 1968

4. Hopkinson and Kay J.D. , *The lighting of buildings* , Faber and Faber, London

REFERENCES:

1. Koerner , R.M,*Construction & Geotechnical Methods in Foundations Engineering*, McGraw Hill, 1984
2. Varma M., *Construction Equipment and its Planning & Application*, Metropolitain Books Co., 1979
3. Smith R.C, Andres, C.K *Principles and Prentice of Heavy Construction*, Prentice Hall, 1986
4. Francis D.K.Ching – *Architecture, Form, Space and Order*-V.N.R NY., 1999
5. William Severns H. and Julian Fellows R. *Air-Conditioning and Refrigeration*, John Wiley and Sons,London,1988
6. *Handbook for Building Engineers in Metric systems*, NBC, New Delhi
7. *National Building Code.*

22PTCEE17 FUNDAMENTALS OF REMOTE SENSING AND GIS 3 0 0 3

OBJECTIVE:

At the end of the course student will posses knowledge on Remote Sensing Techniques and their applications in civil engineering projects.

UNIT – I : INTRODUCTION 9

Definition and types of remote sensing – Wave and Quantum theories – Radiation principle - Components of Electromagnetic Spectrum – Energy balance equations – Components of ideal and real remote sensing system – Energy interaction with Atmosphere – Different types of scattering and absorption - Atmospheric windows – Energy interaction with surface features – Spectral signatures of Vegetation, soil and water.

UNIT–II : PLATFORMS AND SENSORS 9

Aerial and space platforms – Aerial camera - Vertical and Oblique Aerial Photographic techniques - Classification of Satellites based on orbits and purposes - Synoptivity and Repetivity – Resolution and Types - Multistage, Multisensor, Multispectral, Multitemporal and Multipurpose concepts. Orbital and sensor characteristics of the following remote sensing satellites; LANDSAT, SPOT, IRS and IKONOS.

UNIT – III : IMAGE INTERPRETATION 9

Visual Interpretation of Satellite Imageries – Elements of interpretation - Interpretation keys – Digital image processing – Image Rectification and Restoration - Image Enhancement - Image Classification – Filtering – Low and High Pass filters

UNIT – IV : GEOGRAPHICAL INFORMATION SYSTEM 9

Components of GIS – Hardware, Software and Organizational set up – Data – Spatial and Non spatial – Maps – Types of Maps – Types of Georeferencing - Data input – Digitization – Scanning – Data Editing – Raster and Vector data analysis – Overlaying, Buffering – Generation of DEM - Data presentation

UNIT – V : APPLICATIONS OF REMOTE SENSING AND GIS 9

Merits and Limitations of Remote Sensing – Applications of Remote Sensing and GIS in the following fields; Surveying, Water resources, Geological mapping, Route location, Site selection for major civil engineering projects, Disaster and mitigation studies, Coastal zone management and Environmental Engineering

TOTAL: 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Demonstrate the concepts of Electro Magnetic energy, spectrum and spectral signature curves
- Apply the concepts of satellite and sensor parameters and characteristics of different platforms
- Apply the concepts of DBMS in GIS
- Analyze raster and vector data and modelling in GIS
- Apply GIS in land use, disaster management, ITS and resource information system

TEXT BOOKS:

1. Thomas M. Lillesand, Raiph W.Kiefer, *Remote Sensing and Image Interpretation*,
John Wiley and Sons, New York, Third Edition, 1994.
2. Peter A. Burrough, Rachael A. McDonnell. Principles of Geographical Information Systems, Oxford University Press, 1998.

REFERENCES:

1. Robert A. Schowengerdt, *Remote Sensing-Models and Methods for Image Processing*,
Academic Press – An Imprint of Elsevier, California, Second Edition, 2006.
2. Paul J. Curran, *Principles of Remote Sensing*, English Language Book Society/Longman, 1988.
3. Anji Reddy M., *Text Book of Remote Sensing and Geographical Information System*,
BS Publications, Hyderabad, Third Edition, 2006.
4. Anand P.A, Rajesh Kumar V., *Principles of Remote Sensing & GIS*, Sri Vengateswara
Publishers, Kumbakonam, First Edition, 2003.
5. Kumar S., *Remote Sensing and GIS*, Lakshmi Publications Pvt Ltd., New Delhi, 2007.

22PTCEE18 CONSTRUCTION AND PROJECT MANAGEMENT 3 0 0 3

OBJECTIVE

To impart knowledge in planning, construction, projects, schedule the activities, determining cost of project, control the cost of project.

UNIT – I : CONSTRUCTION PLANNING 9

Basic concepts in the development of construction plans-choice of Technology and Construction method-Defining Work Tasks- Definition- Precedence relationships among activities-Estimating Activity Durations-Estimating Resource Requirements for work activities-coding systems

UNIT – II : SCHEDULING PROCEDURES AND TECHNIQUES 9

Relevance of construction schedules-Bar charts - The critical path method-Calculations for critical path scheduling-Activity float and schedules-Presenting project schedules-Critical path scheduling for Activity-on-node and with leads, Lags and Windows-Calculations for scheduling with leads, lags and windows-Resource oriented scheduling-Scheduling with resource constraints and precedence -Use of Advanced Scheduling Techniques-Scheduling with uncertain durations-Crashing and time/cost trade offs -Improving the Scheduling process – Introduction to application software

UNIT – III : COST CONTROL MONITORING AND ACCOUNTING 9

The cost control problem-The project Budget-Forecasting for Activity cost control - financial accounting systems and cost accounts-Control of project cash flows-Schedule control-Schedule and Budget updates-Relating cost and schedule information

UNIT – IV: QUALITY CONTROL AND SAFETY DURING CONSTRUCTION 9

Quality and safety Concerns in Construction-Organizing for Quality and Safety-Work and Material Specifications-Total Quality control-Quality control by statistical methods -Statistical Quality control with Sampling by Attributes-Statistical Quality control by Sampling and Variables-Safety.

UNIT – V : ORGANIZATION AND USE OF PROJECT INFORMATION 9

Types of project information-Accuracy and Use of Information-Computerized organization and use of Information -Organizing information in databases-relational model of Data bases-Other conceptual Models of Databases-Centralized database Management systems-Databases and application programs-Information transfer and Flow.

TOTAL: 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Demonstrate the nuances of management functions
- Analyze the framework of a business organization
- Adopt an empirical approach toward business situations
- Apply various Project Management techniques
- Implement roles of team players

TEXT BOOKS:

1. Chitkara, K.K. *Construction Project Management Planning, Scheduling and Control*, Tata McGraw-Hill Publishing Co., New Delhi, 1998.
2. Punmia B.C. and Khandelwal, *Project planning and Control with PERT and CPM*, Laxmi Publications, New Delhi, 2002.

REFERENCES:

1. Ghalot P.S., Dhir D.M., *Construction Planning and Management*, Wiley eastern Limited, 1992.
2. Chris Hendrickson and Tung Au, *Project Management for Construction – Fundamentals Concepts for Owners, Engineers, Architects and Builders,* Prentice Hall, Pitsburgh, 2000

22PTCEE19 PROJECT SAFETY MANAGEMENT 3 0 0 3

OBJECTIVE

- To study and understand the various safety concepts and requirements applied to construction projects.
- To study 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 : OWNERS' AND DESIGNERS' OUTLOOK 9

Owner's responsibility for safely – Owner preparedness – Role of designer in ensuring safety – Safety clause in design document.

TOTAL: 45 Hours

OUTCOME :

On completion of this course the students will be able to

- know various constructions safety concepts.
- Carryout various safety programmes
- Challenge contractual obligations task

TEXT BOOKS:

1. Jimmy W. Hinze, Construction Safety, Prentice Hall Inc., 1997.
2. Richard J. Coble, Jimmie Hinze and Theo C. Haupt, Construction Safety and Health Management, Prentice Hall Inc., 2001.

REFERENCES:

1. Tamilnadu Factory Act, Department of Inspectorate of factories, Tamil Nadu. Health Management, Prentice Hall Inc., 2001.

22PTCEE20 REPAIR AND REHABILITATION OF STRUCTURES 3 0 0 3

OBJECTIVE:

To get the knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedure

UNIT – I : MAINTENANCE AND REPAIR STRATEGIES 9

Maintenance, repair and rehabilitation, Facts of Maintenance, importance of Maintenance various aspects of inspection , assessment procedure for evaluating a damaged structure, causes of deterioration.

UNIT – II : SERVICEABILITY AND DURABILITY OF CONCRETE 9

Quality assurance for concrete construction, concrete properties- strength, permeability, thermal properties and cracking- effects due to climate, temperature, chemical, corrosion- Design and construction errors-effects of cover thickness and cracking.

UNIT – III : MATERIAL TECHNIQUES FOR REPAIR 9

Special concretes and mortar, concrete chemical, special elements for accelerated strength gain, expansive cement, polymer concrete, sulphur infiltrated concrete, ferro cement, fibre reinforced concrete, rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vaccum concrete, gunite and shotcrete, epoxy injection, mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic protection.

UNIT – IV : REPAIRS,REHABILITATION AND RETROFITTING OF STRUCTURES 9

Repairs to overcome low member strength, deflection, cracking, chemical disruption,weathering corrosion, wear, fire, leakage and marine exposure.

UNIT – V : DEMOLITION TECHNIQUES 9

Engineered demolition techniques for dilapidated structures- case studies.

Total: 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- demonstrate the condition of structures
- Inspect and evaluate the damaged structures
- Implement the repairing techniques of a structure
- Demonstrate the dismantling and demolishing structures

TEXT BOOKS:

1. Shetty, M.S.,*Concrete Technology- Theory and Practice*, S. Chand and company,
New Delhi,1992

REFERRENCES:

1. Santhakumar A.R, *Training Course notes on Damage Assessment and Repair in Low cost housing*, "RHDC.NBO" Anna University, july 1992.
2. Raikar R.N., *Learning from failures - deficiencies in design, construction and services* – R & D centre (SDCPL), raikar bhavan, Bombay,1987.
3. Palaniyappan, N., *Estate management*, Anna Institute of Management, Chennai,1992.
4. Lakshmipathy, M. etal., *Lecture notes of workshop on Repairs and Rehabilitation of structures*, 29-30th october 1999.

22PTCEE21 CONSTRUCTIONAL PERSONNEL MANAGEMENT 3 0 0 3

OBJECTIVE

To study the various aspects of manpower management such as man power planning, organization, human relations, welfare and development methods in construction.

UNIT – I : MANPOWER PLANNING 9

Manpower Planning process , Organising, Staffing, directing, and controlling – Estimation, manpower requirement – Factors influencing supply and demand of human resources – Role of HR manager – Personnel Principles.

UNIT – II : ORGANISATION 9

Requirement of Organisation – Organisation structure – Organisation Hierarchical charts – Staffing Plan - Development and Operation of human resources - Managerial Staffing – Recruitment – Selection strategies – Placement and Training.

UNIT – III : HUMAN RELATIONS AND ORGANISATIONAL BEHAVIOUR 9

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

UNIT – IV: WELFARE MEASURES 9

Compensation – Safety and health – GPF – EPF – Group Insurance – Housing - Pension – Laws related to welfare measures.

UNIT – V : MANAGEMENT AND DEVELOPMENT METHODS 9

Wages and Salary, Employee benefits, Employee appraisal and assessment – Employee services – Safety and Health Management – Special Human resource problems – Productivity in human resources – Innovative approach to designing and managing organization – Managing New Technologies – Total Quality Management – Concept of quality of work life – Levels of change in the organizational Development – Requirements of organizational Development – System design and methods for automation and management of operations – Developing policies, practices and establishing process pattern – Competency upgradation and their assessment – New methods of training and development – Performance Management.

TOTAL: 45 Hours

OUTCOME :

On completion of this course the students will know

- Processes in manpower planning, organizational and welfare measures
- Increasing productivity with human welfare aspects
- Various development policies

TEXT BOOKS:

1. Carleton Counter II and Jill Justice Coutler, The Complete Standard Handbook of
Construction Personnel Management, Prentice-Hall, Inc., 1989.
2. Charles D Pringle, Justin Gooderi Longenecter, Management, CE Merril Publishing
Co. 1981.
3. Dwivedi R.S, Human Relations and Organisational Behaviour, Macmillian India Ltd.,2005.

REFERENCES:

1. Josy.J. Familaro, Handbook of Human Resources Administration, McGraw-Hill International Edition, 1987.
2. Memoria,C.B., Personnel Management, Himalaya Publishing Co., 1997.

22PTCEE22 INDUSTRIAL WASTE MANAGEMENT 3 0 0 3

OBJECTIVE

This subject deals with the pollution from major industries and methods of controlling the same. The student is expected to know about the polluting potential of major industries in the country and the methods of controlling the same.

UNIT – I :INTRODUCTION 9

Types of industries and industrial pollution – Characteristics of industrial wastes – Population equivalent – Bioassay studies – effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health – Environmental legislations related to prevention and control of industrial effluents and hazardous wastes

UNIT – II : CLEANER PRODUCTION 9

Waste management Approach – Waste Audit – Volume and strength reduction – Material and process modifications – Recycle, reuse and byproduct recovery – Applications.

UNIT – III :POLLUTION FROM MAJOR INDUSTRIES 9

Sources, Characteristics, waste treatment flow sheets for selected industries such as Textiles, Tanneries, Pharmaceuticals, Electroplating industries, Dairy, Sugar, Paper, distilleries, Steel plants, Refineries, fertilizer, thermal power plants – Wastewater reclamation concepts

UNIT – IV :TREATMENT TECHNOLOGIES 9

Equalisation – Neutralisation – Removal of suspended and dissolved organic solids - Chemical oxidation – Adsorption - Removal of dissolved inorganics – Combined treatment of industrial and municipal wastes – Residue management – Dewatering - Disposal

UNIT – V :HAZARDOUS WASTE MANAGEMENT 9

Hazardous wastes - Physico chemical treatment – solidification – incineration – Secured land fills

TOTAL : 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Demonstrate the polluting potential of major industries
- Carry out various methods to control the pollutants

TEXT BOOKS:

1. M.N.Rao&A.K.Dutta, *Wastewater Treatment*, Oxford - IBH Publication, 1995.
2. W .W. Eckenfelder Jr., *Industrial Water Pollution Control*, McGraw-Hill Book Company, NewDelhi, 2000.

REFERENCE :

1. T.Shen, *Industrial Pollution Prevention*, Springer, 1999.
2. R.L.Stephenson and J.B.Blackburn, Jr., *Industrial Wastewater Systems Hand book*, Lewis Publisher, New Yark, 1998
3. H.M.Freeman, *Industrial Pollution Prevention Hand Book*, McGraw-Hill Inc., New Delhi,1995.
4. Bishop, P.L., *Pollution Prevention: Fundamental & Practice*, McGraw-Hill, 2000.

22PTCEE23 HAZARDOUS WASTE MANAGEMENT 3 0 0 3

OBJECTIVE:

To impart knowledge and skills in the collection, storage, transport, treatment, disposal and recycling options for hazardous wastesincluding the related engineering principles, design criteria, methods and equipments.

UNIT – I: SOURCES, CLASSIFICATION AND REGULATORY FRAMEWORK 9

Types and Sources of hazardous wastes – Need for hazardous waste management – Salient features of Indian legislations on management and handling of hazardous wastes, biomedical wastes, nuclear wastes -lead acid batteries, electronic wastes, plastics and fly ash –Elements of integrated waste management and roles of stakeholders -Financing and Public Private Participation for waste management.

UNIT –II: WASTE CHARACTERIZATION AND SOURCE REDUCTION 9

Waste generation rates and variation -Composition, physical, chemical and biological properties of hazardous wastes –Hazardous Characteristics –TCLP tests –waste sampling and characterization plan -Source reduction of wastes – Waste exchange - Extended producer responsibility-Recycling and reuse.

UNIT – III: STORAGE, COLLECTION AND TRANSPORT OF WASTES 9

Handling and segregation of wastes at source –storage and collection of hazardous wastes –Analysis of Collection systems -Need for transfer and transport –Transfer stations Optimizing waste allocation–compatibility, storage, labeling and handling of hazardous wastes –hazardous waste manifests and transport.

UNIT –IV: WASTE PROCESSING TECHNOLOGIES 9

Objectives of waste processing –material separation and processing technologies - biological and chemical conversion technologies –methods and controls of Composting -thermal conversion technologies and energy recovery – incineration - solidification andstabilization of hazardous wastes - treatment of biomedical wastes - Health considerations in the context of operation of facilities, handling of materials and impact of outputs on the environment.

UNIT – V: WASTE DISPOSAL 9

Waste disposal options –Disposal in landfills -Landfill Classification, types and methods –site selection -design and operation of sanitary landfills, secure landfills andlandfill bioreactors –leachate and landfill gas management –landfill closure and environmental monitoring –Rehabilitation of open dumps –landfill remediation

TOTAL: 45 PERIODS

OUTCOMES

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

- Understand the characteristics of different types of solid and hazardous wastes and the factors affecting variation
- Define and explain important concepts in the field of solid waste management and suggest suitable technical solutions for treatment of municipal and industrial waste
- Understand the role legislation and policy drivers play in stakeholders' response to the waste and apply the basic scientific principles for solving practical waste management challenges

TEXT BOOKS:

1. George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, "Integrated Solid Waste Management, Mc-Graw Hill International edition, New York, 1993.
2. Michael D. LaGrega, Philip L Buckingham, Jeffrey C. E vans and Environmental Resources Management, Hazardous waste Management, Mc-Graw Hill International edition, New York, 2001.

REFERENCES

1. CPHEEO, "Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organisation , Government of India, New Delhi, 2000.
2. Vesilind P.A., Worrell W and Reinhart, Solid waste Engineering, Thomson Learning Inc., Singapore, 2002.
3. Paul TWilliams, Waste Treatment and Disposal, Wiley, 2005

22PTCEE24 AIR POLLUTION MONITORING AND CONTROL 3 0 0 3

OBJECTIVE

This subject covers the sources, characteristics and effects of air and noise pollution and the methods of controlling the same. The student is expected to know about source inventory and control mechanism.

UNIT – I : SOURCES AND EFFECTS OF AIR POLLUTANTS 9

Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Source inventory – Effects of air pollution on human beings, materials, vegetation, animals – global warming-ozone layer depletion, Sampling and Analysis – Basic Principles of Sampling – Source and ambient sampling – Analysis of pollutants – Principles.

UNIT – II : DISPERSION OF POLLUTANTS 9

Elements of atmosphere – Meteorological factors – Wind roses – Lapse rate - Atmospheric stability and turbulence – Plume rise – Dispersion of pollutants – Dispersion models – Applications.

UNIT – III : AIR POLLUTION CONTROL 9

Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation – Selection criteria for equipment - gaseous pollutant control by adsorption, absorption, condensation, combustion – Pollution control for specific major industries.

UNIT – IV : 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 and Air quality

UNIT – V : NOISE POLLUTION 9

Sources of noise pollution – Effects – Assessment - Standards – Control methods - Prevention

TOTAL : 45 Hours

OUTCOME :

At the end of the course, the student will be able to have a thorough knowledge in the

- Causes of air pollution
- Effects of air and noise pollution
- Effective air pollution management

TEXT BOOKS:

1. Anjaneyulu, D., *Air Pollution and Control Technologies*, Allied Publishers, Mumbai, 2002.
2. Rao, C.S., *Environmental Pollution Control Engineering*, Wiley Eastern Ltd., New Delhi, 1996.

REFERENCES:

1. Rao M.N., and Rao H. V. N., *Air Pollution Control*, Tata-McGraw-Hill, New Delhi, 1996.
2. W.L.Heumann, *Industrial Air Pollution Control Systems*, McGraw-Hill, New Yark, 1997
3. Mahajan S.P., *Pollution Control in Process Industries*, Tata McGraw-Hill Publishing Company, New Delhi, 1991.
4. Peavy S.W., Rowe D.R. and Tchobanoglous G. *Environmental Engineering*, McGraw Hill, New Delhi, 1985.
5. Garg, S.K., *Environmental Engineering Vol. II*, Khanna Publishers, New Delhi
6. Mahajan, S.P., *Pollution Control in Process Industries*, Tata McGraw-Hill, New Delhi, 1991

22PTCEE25 MUNICIPAL SOLID WASTE MANAGEMENT 3 0 0 3

OBJECTIVE

This subject covers the various sources and characterisation of municipal solid wastes and the on-site/off-site processing of the same and the disposal methods. The student is expected to know about the various effects and disposal options for the municipal solid waste.

UNIT – I : SOURCES AND TYPES OF MUNICIPAL SOLID WASTES 9

Sources and types of solid wastes - Quantity – factors affecting generation of solid wastes; characteristics – methods of sampling and characterization- Effects of improper disposal of solid wastes – public health effects. Principle of solid waste management – social & economic aspects- Public awareness- Role of NGOs- Legislation.

UNIT – II : ON-SITE STORAGE & PROCESSING 9

On-site storage methods – materials used for containers – on-site segregation of solid wastes – public health & economic aspects of storage – options under Indian conditions – Critical Evaluation of Options.

UNIT – III : COLLECTION AND TRANSFER 9

Methods of Collection – types of vehicles – Manpower requirement – collection routes- transfer stations – selection of location, operation & maintenance; options under Indian conditions.

UNIT – IV : OFF-SITE PROCESSING 9

Processing techniques and Equipment; Resource recovery from solid wastes – composting, incineration, Pyrolysis - options under Indian conditions.

UNIT – V : DISPOSAL 9

Dumping of solid waste; sanitary land fills – site selection, design and operation of sanitary landfills – Leachate collection & treatment

TOTAL : 45 Hours

OUTCOME :

At the end of the course, the student will be able to have knowledge in

- Sources and characterization of municipal solid wastes
- on-site/off-site processing of municipal solid wastes and disposal methods.
- Effective municipal solid waste management

TEXT BOOKS:

1. George Tchobanoglous et.al., *Integrated Solid Waste Management*, McGraw-Hill
Publishers, 1993.

REFERENCES:

1. B.Bilitewski, G.HardHe, K.Marek, A.Weissbach, and H.Boeddicker, *Waste Management*, Springer, 1994.
2. *Manual on Municipal Solid Waste Management*, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2000
3. R.E.Landreth and P.A.Rebers, *Municipal Solid Wastes – problems and Solutions*,
Lewis Publishers, 1997.
4. Bhide A.D. and Sundaresan, B.B., *Solid Waste Management in DevelopingCountries*,
INSDOC, 1993.

22PTCEE26 MARINE POLLUTION MONITORING AND CONTROL 3 0 0 3

OBJECTIVES:

This subject educate the students about Coastal and Marine environment, ocean dynamics, sources of marine pollution and methods for monitoring, modeling and control.

UNIT I: MARINE ENVIRONMENT 9

Seas and oceans, Continental area, Coastal zone, Properties of sea water, Principles of Marine Geology, coastal features –Beaches, Estuaries, Lagoons–The oceans and climate

UNIT II: OCEANHYDRODYNAMICS 9

Wave Theory, Waves in shallow waters –Refraction, Diffraction and Shoaling, Approximations for deep and shallow water conditions –Tidal Classification -
General circulation of ocean waters-Ocean currents -Coastal sediment transport -
Onshore offshore sediment transport -Beach formation and coastal processes - Tsunamis, storm surge, El Nino effect.

UNIT III: MARINE POLLUTION SOURCES AND EFFECTS 9

Sources of Marine Pollution –Point and non-point sources, Pollution caused by Oil Exploration, Dredging, Offshore Structures, Agriculture Impacts of pollution on water quality and coastal ecosystems –Marine discharges and effluent standards

UNIT IV: MONITORING OF MARINEPOLLUTION 9

Basic measurements -Sounding boat, lead lines, echo sounders –current meters - tide gauge -use of GPS –Measurement of coastal water characteristics –sea bed sampling
–Modeling of Pollutant transport and dispersion -Oil Spill Models -Ocean Monitoring satellites –Applications of Remote Sensing and GIS in monitoring marine pollution

UNIT V: MARINE POLLUTION CONTROL AND ICZM 9

Design of out falls-Pollution Control strategies–Selection of optimal Outfall locations-National and International Treaties, Coastal Zone Regulation–Total Maximum DailyLoad applications –Protocols in Marine Pollution –ICZM and Sustainable Development

TOTAL: 45 PERIODS

OUTCOME :

- Ability to know about marine environment and would have learnt the physical concepts lying behind the oceanic currents and natural processes of various activities happening over the marine environment.
- Acquired knowledge on the marine pollution and the effect of the same on the ecology.
- Should have gained knowledge on remote sensing and various other techniques for measuring and monitoring oceanic environment parameters.
- Should have acquired knowledge on control of marine pollution and sustainable development

TEXT BOOKS:

1.Marine Pollution (5thEdition) R.B. Clark, C. Frid and M Atttrill Oxford Science Publications, 2001
2.Marine pollution Dr.P.C.Sinha , Anmol Publications Pvt. Ltd, 1998.

REFERENCES:

1.Problems of Marine Pollution : India and Canada, Raghavan, Sudha , Eastern Book Corporation,Delhi, India,
2.Laws, E.A., Aquatic pollution, an introductory text. John Wiley and Sons, Inc., New York, 2000

22PTCEE27 ENVIRONMENTAL IMPACT ASSESSMENT 3 0 0 3

OBJECTIVE

This subject deals with the various impacts of infrastructure projects on the components of environment and method of assessing the impact and mitigating the same.

The student is expected to know about the various impacts of development projects on environment and the mitigating measures.

UNIT – I : INTRODUCTION 9

Impact of development projects under Civil Engineering on environment - Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) – EIA capability and limitations – Legal provisions on EIA.

UNIT – II : METHODOLOGIES 9

Methods of EIA –Check lists – Matrices – Networks – Cost-benefit analysis – Analysis of alternatives – Case studies.

UNIT – III : PREDICTION AND ASSESSMENT 9

Assessment of Impact on land, water and air, noise, social, cultural flora and fauna-Mathematical models- public participation – Rapid EIA.

UNIT – IV : ENVIRONMENTAL MANAGEMENT PLAN 9

Plan for mitigation of adverse impact on environment – options for mitigation of impact on water, air and land, flora and fauna; Addressing the issues related to the Project Affected People – ISO 14000

UNIT – V : CASE STUDIES 9

EIA for infrastructure projects – Bridges – Stadium – Highways – Dams – Multi-storey Buildings – Water Supply and Drainage Projects

TOTAL : 45 Hours

OUTCOME :

At the end of the course, the student will be able tounderstand

- Impacts of development projects on environment
- Mitigating measures on environmental impact accessment
- Safe environmental plan to avoid Impacts on water, air, land, flora and fauna

TEXT BOOKS:

1. Canter, R.L., *Environmental Impact Assessment*, McGraw-Hill Inc., New Delhi, 1996.

REFERENCES:

1. Shukla, S.K. and Srivastava, P.R., *Concepts in Environmental Impact Analysis*, Common Wealth Publishers, New Delhi, 1992.
2. John G. Rau and David C Hooten (Ed)., *Environmental Impact Analysis Handbook*, McGraw-Hill Book Company, 1990.
3. Judith Petts, *Handbook of Environmental Impact Assessment Vol. I & II*, Blackwell Science, 1999.

22PTCEE28 COASTAL ZONE MANAGEMENT 3 0 0 3

OBJECTIVE

At the end of the semester, the student shall be able to understand the coastal processes, coastal dynamics, impacts of structures like docks, harbours and quays leading to simple management perspectives along the coastal zone.

UNIT – I : COASTAL ZONE 9

Coastal zone – Coastal zone regulations – Beach profile – Surf zone – Off shore – Coastal waters – Estuaries – Wet lands and Lagoons – Living resources – Non living resources.

UNIT – II : WAVE DYNAMICS 9

Wave classification – Airy's Linear Wave theory – Deep water waves – Shallow water waves – Wave pressure – Wave energy – Wave Decay – Reflection, Refraction and Diffraction of waves – Breaking of waves – Forces due to waves.

UNIT – III: WAVE FORECASTING AND TIDES 9

Need for forecasting - SMB and PNJ methods of wave forecasting – Classification of tides – Darwin's equilibrium theory of tides – Effects on structures – seiches, Surges and Tsunamis

UNIT – IV : COASTAL PROCESSES 9

Erosion and depositional shore features – Methods of protection – Littoral currents – Coastal aquifers – Sea water intrusion – Impact of sewage disposal in seas.

UNIT – V : HARBOURS 9

Types of classification of harbours – Requirements of a modern port – Selection of site – Types and selection of break waters – Need and mode of dredging – Selection of dredgers.

TOTAL : 45Hours

OUTCOME :

At the end of the course, the student will be able tounderstand

- coastal dynamics and wave dynamics
- Impacts of coastal structures due to various forces
- Forecasting waves and tides
- Determinants of harbour in selection of site

TEXT BOOKS:

1. Richard Sylvester, Coastal Engineering, Volume I and II, Elsevier Scientific Publishing Co., 1999
2. Ippen A.T., Coastline Hydrodynamics, McGraw-Hill Inc., New York, 1993

REFERENCES:

1. Narasimhan, Kathiroli S., Harbour and Coastal Engineering (Indian Scenario) Vol-I & II, NIOT – Chennai.
2. Quinn A.D., Design & Construction of Ports and Marine Structures, McGraw- Hill Book Co., 1999

22PTCEE29 ADVANCED STRUCTURAL ANALYSIS 3 0 0 3

OBJECTIVE

To Study the Energy Concepts in Structures, Characteristics and Transformation of Structures.

UNIT – I : ENERGY CONCEPTS IN STRUCTURES 9

Introduction – Strain Energy – Symmetry of The Stiffness And Flexibility Matrices – Strain Energy in Terms of Stiffness And Flexibility Matrices – Stiffness And Flexibility Coefficients in Terms of Strain Energy – Additional properties of [a] and [k] – another Interpretation of coefficients aij and kij – Betti's law – Applications of Betti's law: Forces not at the coordinates – Strain energy in systems and in Elements.

UNIT – II : CHARACTERSTICS OF STRUCTURES – STIFFNESS AND FLEXIBILITY 9

Introduction – Structure with Single Coordinate- Two Coordinates-Flexibility and Stiffness Matrices in Coordinates- Examples-Symmetric Nature of Matrices-Stiffness and Flexibility Matrices in Constrained Measurements- Stiffness and Flexibility of Systems and Elements-Computing Displacements and Forces form Virtual Work-Computing Stiffness and Flexibility Coefficients.

UNIT – III : TRANSFORMATION OF INFORMATION IN STRUCTURES 9

Determinate- Indeterminate Structures-Transformation of System Forces to Element Forces-Element Flexibility to System Flexibility - System Displacement to Element Displacement-Element Stiffness to System Stiffness-Transformation of Forces and Displacements in General –Stiffness and Flexibility in General – Normal Coordinates and Orthogonal Transformation-Principle of Contregradience

UNIT – IV : THE FLEXIBILITY METHOD 9

Statically Determinate Structures –Indeterminate Structures-Choice of Redundant Leading to Ill and Well Conditioned Matrices-Transformation to One Set of Redundant to Another-Internal Forces due to Thermal Expansion and Lack of Fit-Reducing the Size of Flexibility Matrix-Application to Pin-Jointed Plane Truss-Continuous Beams-Frames-Grids.

UNIT – V : THE STIFFNESS METHOD 9

Introduction-Development of Stiffness Method- Stiffness Matrix for Structures with zero Force at some Coordinates-Analogy between Flexibility and Stiffness-Lack of Fit-Stiffness Matrix with Rigid Motions-Application of Stiffness Approach to Pin Jointed Plane Trusses-Continuous Beams-Frames-Grids-Space Trusses and Frames-Introduction Only-Static Condensation Technique-Choice of Method-Stiffness or Flexibility.

Total: 45Hours

OUTCOME :

At the end of the course, the student will be able to:

- Know about energy concepts in structures
- Carry out transformation of information in structures
- Demonstrate the characteristics of structures

TEXT BOOKS:

1. Dr. Devadas Menon., "Advanced Structural Analysis", Narosa Publishing House, New Delhi, 2009
2. Pandit G.S. and Gupta S.P., "Structural Analysis-A Matrix Approach", Tata McGraw-Hill PublishingCompany Limited, New Delhi, 1997
3. Reddy C.S., "Basic Structural Analysis", Tata McGraw-Hill Publishing Company Limited, New Delhi, 1997

REFERENCES:

1. 1. K. Rubinstein.F.M., " Matrix Computer Methods of Structural Analysis", Prentice Hall, Inc. N.J., 1966
2. Rubinstein.F.M., " Matrix Computer Methods of Structural Analysis", Prentice Hall, Inc. N.J., 1966

22PTCEE30 STORAGE STRUCTURES 3 0 0 3

OBJECTIVE

To introduce the student to basic theory and concepts of design of storage structures like steel and concrete tanks, bunkers and silos.

UNIT – I: STEEL WATER TANKS 9

Design of rectangular riveted steel water tank – Tee covers – Plates – Stays – Longitudinal and transverse beams – Design of staging – Base plates – Foundation and anchor bolts – Design of pressed steel water tank – Design of stays – Joints – Design of hemispherical bottom water tank – side plates – Bottom plates – joints – Ring girder – Design of staging and foundation.

UNIT – II: CONCRETE WATER TANKS 9

Design of Circular tanks – Hinged and fixed at the base – IS method of calculating shear forces and moments – Hoop tension – Design of intze tank – Dome – Ring girders – Conical dome – Staging – Bracings – Raft foundation – Design of rectangular tanks – Approximate methods and IS methods – Design of under ground tanks – Design of base slab and side wall – Check for uplift.

UNIT – III: STEEL BUNKERS AND SILOS 9

Design of square bunker – Jansen‟s and Airy‟s theories – IS Codal provisions – Design of side plates – Stiffeners – Hooper – Longitudinal beams – Design of cylindrical silo – Side plates – Ring girder – stiffeners.

UNIT – IV: CONCRETE BUNKERS AND SILOS 9

Design of square bunker – Side Walls – Hopper bottom – Top and bottom edge beams – Design of cylindrical silo – Wall portion – Design of conical hopper – Ring beam at junction

UNIT – V: PRESTRESSED CONCRETE WATER TANKS 9

Principles of circular prestressing – Design of prestressed concrete circular water tanks.

Total: 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Design steel water tanks, bunkers and silos
- Design reinforced concrete water tanks, bunkers, silos and prestressed concrete water tanks

TEXT BOOKS:

1. Rajagopalan K., "Storage Structures", Tata McGraw Hill, New Delhi, 1998.
2. Krishna Raju N., "Advanced Reinforced Concrete Design", CBS Publishers and Distributors, New Delhi, 1998.

REFERENCES:

1. Punmia B.C, Ashok Kumar Jain, Arun K.Jain, "R.C.C. Designs Reinforced Concrete Structures", Laxmi Publications Pvt. Ltd., New Delhi, 2006.

2. Gambhir.M.L., "Design of Reinforced Concrete Structures", Prentice Hall of India Private Limited, 2012.

22PTCEE31 PRESTRESSED CONCRETE STRUCTURES 3 0 0 3

OBJECTIVE

At the end of this course the student shall have a knowledge of methods of prestressing, advantages of prestressing concrete, the losses involved and the design methods for prestressed concrete elements under codal provisions.

UNIT – I : INTRODUCTION 9

Principles – Pretensioning – Post tensioning – Types of prestressing – Systems of prestressing – Comparison of prestressed concrete with reinforced concrete Materials characteristics of concrete – Characteristics of high tensile steel.

Theory and behaviour of prestressed concrete beams in bending – calculating fibre stresses for various sections (Rectangle, I, T) of simply supported beam due to prestressing force, dead load and external live load – Stress method – Moment of Resistance method – Load balancing method.

UNIT – II : LOSSES AND DEFLECTIONS 9

Various losses in prestressed concrete members – causes for losses in prestressed concrete – calculation of losses – losses due to elastic shortening of pretensioned and post tensioned members – losses due to creep, shrinkage of concrete – relaxation losses – friction and anchorage losses.
Deflection of prestressed concrete flexural members due to prestressing force, dead load, live load – BIS Code provisions – Effect of tendon Profile on deflection – Calculation of elastic short term deflection for simply supported beams – deflections due to creep effect – calculation of long term deflection.

UNIT – III : DESIGN OF PRESTRESSED CONCRETE BEAMS 9

Pre tensioned and Post tensioned simply supported rectangle, I and T sections – Stress method – Design for flexure, bond and shear – IS Code provisions.

UNIT – IV : DESIGN OF END BLOCKS 9

Introduction – Stress distribution in end block – Anchorage zone stresses – Guyon and Magnell method.

UNIT – V : CIRCULAR PRESTRESSING, TENSION MEMBERS CONTINUOUS BEAMS , COMPOSITE AND PARTIAL PRESTRESSING 9

Design of prestressed concrete pipes and tanks – Tension members - Poles and sleepers – Continuous beams – Concordant Cable Profile.
Types of composite construction – Transformation of composite sections – flexural analysis of composite simply supported beams – calculation of stresses – Partial prestressing.

Total: 45Hours

OUTCOME :

At the end of the course, the student will be able to:

- Design a prestressed concrete beam accounting for losses
- Design the anchorage zone for post tensioned members
- Design composite members
- Design continuous beams

TEXT BOOKS:

1. Sinha, N.C and Roy. S.K., *Fundamentals of prestressed concrete* S.Chand and Co. Ltd 1985.
2. Krishnaraju.N., *Prestressed Concrete*, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1998.

REFERENCES:

1. Lin , T.Y., and Ned .Burns, *Design of prestressed concrete structures*, John Wiley & Sons, International Edition, New York, 1995.
2. Dayaratnam.P., *Prestressed Concrete Structures*, Oxford and IBH Publishing Company Pvt. Ltd., New Delhi, 1982.
3. Mallic S.K. and Gupta A.P., *Prestressed concrete*, Oxford and IBH publishing Co. Pvt. Ltd. 1997.
4. Ramaswamy G.S., *Modern prestressed concrete design*, Arnold Heinimen, New Delhi, 1990

22PTCEE32 ADVANCED STEEL STRUCTURES 3 0 0 3

(Use of IS 800 – 2007, IS 6533-1971, IS 801 & IS 811& Steel tables are permitted)

OBJECTIVE

This course covers the design of structural steel members subjected to compressive, tensile and bending loads, as per current codal provisions including connections. Design of structural systems such as roof trusses, chimneys, built-up girders and light-gauge structures are included.

UNIT – I : CONNECTIONS 9

Design of bolts and weld connections (Stiffened and Seated connections) – Beam to Beam Connections-Beam to Column Connections.

UNIT – II : CHIMNEYS 9

Design of Chimneys – Self Supporting type- Guyed type at single level – Foundation for Chimney.

UNIT – III : BUILT-UP GIRDER 9

Design of Plate girders bolted and welded –Design of stiffeners and splices-Gantry girder

UNIT – IV : PLASTIC ANALYSIS 9

Introduction to Plastic analysis – ductility – plastic bending of beams – stages of bending – shape factor – plastic hinge – load factor – failure mechanism - upper and lower bound theorems of plastic analysis – collapse load for beams and frames.

UNIT – V : LIGHT GAUGE STEEL STRUCTURES 9

Types of cross sections - local buckling and lateral buckling - concepts of elastic width – design of compression and tension members, beams, deflection of beams and design of beam webs.

Total: 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- design welded plate girder and other components and Gantry girder
- Connections between beam and columns
- carry out wind load calculations for tall structures and design of steel chimneys
- design the cold-formed steel beams and columns.

TEXT BOOKS:

1. Duggal S.K., *Limit State Design of Steel Structures*, Tata McGraw-Hill Publishing Company , New Delhi, 2010.
2. Subramanian N., *Design of Steel Structures*, First edition, OXFORD university press, 2008
3. Bhavikatti S S., *Design of Steel Structures by Limit Method*, I.K. International Pvt Ltd, New Delhi, 2009.

REFERENCES:

1. Chandra R., *Limit State Design of Steel Structure Vol – I & II*, Scientific Publisher, New Delhi,2009.
2. Ramachandra S., & Virendra Gehlot D.,*Limit State Design of Steel Structures* –, Standard Publication, New Delhi,2009.
3. Dayaratnam P., *Design of Steel Structures*, Second Edition, S. Chand & Company, 2003
4. *Teaching Resources for Structural Steel Design – Vol.I & II*, INSDAG, Kolkatta
5. *IS 800:2007 Code of practice for general construction steel*
6. *SP 6 IS Structural steel Design Illustrated Hand book*
7. *IS 875:1987 Code of practice for Design loads (other than earthquake) for buildings and structures (Part – I) Dead loads (Part – II) Live loads (Part – III) Wind loads*
8. *IS: 801-1967, Code of practice for use of cold-formed light gauge steel structural members in general building construction*
9. *IS 6533:1989 (Part – I) Design and Construction of Steel Chimney (Structural Aspect)*
10. *IS: 811-1987, Cold Formed Light Gauge Structural Steel Sections.*

22PTCEE33 COMPUTER AIDED DESIGN OF STRUCTURES 3 0 0 3

OBJECTIVE

This subject introduce the students about computer graphics, structural analysis, design and optimization and expert systems, applications in analysis.

UNIT – I : INTRODUCTION 9

Fundamental reason for implementing CAD - Software requirements – Hardware components in CAD system – Design process - Applications and benefits.

UNIT – II : COMPUTER GRAPHICS 9

Graphic Software – Graphic primitives - Transformations - 2 Dimensional and 3 Dimensional transformations – Concatenation - Wire frame modeling - Solid modeling - Graphic standards - Drafting packages – Auto CAD.

UNIT – III : STRUCTURAL ANALYSIS 9

Principles of structural analysis - Fundamentals of finite element analysis - Concepts of finite elements – Stiffness matrix formulation – Variational Method – Weighted residual method – Problems – Conditions of convergence of functions – Analysis packages and applications.

UNIT – IV : DESIGN AND OPTIMIZATION 9

Principles of design of steel and RC structures - Beams and Columns - Applications to simple design problems - Optimization techniques - Algorithms - Linear programming.

UNIT – V : EXPERT SYSTEMS 9

Introduction to artificial intelligence - Knowledge based expert systems – Applications of KBES- Rules and decision tables - Inference mechanisms - simple applications

Total: 45Hours

OUTCOME :

At the end of the course, the student will be able to

- Demonstrate CAD system applications and their benefits
- Gain knowledge about computer graphics
- Know about concepts of finite elements and also optimization techniques
- Gain knowledge aboutartificial intelligence and its applications

TEXT BOOKS:

1. Groover M.P. and Zimmers E.W. Jr., "CAD/CAM, Computer Aided Design and Manufacturing", Prentice Hall of India Ltd, New Delhi, 1993.
2. Krishnamoorthy C.S.Rajeev S., "Computer Aided Design", Narosa Publishing House, New Delhi, 1993

REFERENCES:

1. Harrison H.B., "Structural Analysis and Design", Part I and II Pergamon Press, Oxford, 1990.
2. Rao S.S., "Optimisation Theory and Applications", Wiley Eastern Limited, New Delhi, 1977.
3. Richard Forsyth (Ed), "Expert System Principles and Case Studies", Chapman and Hall, London, 1989.

22PTCEE34 TALL BUILDINGS 3 0 0 3

OBJECTIVE

The design aspects and analysis methodologies of tall buildings will be introduced. The stability analysis of tall buildings is another important objective of this course.

UNIT – I : DESIGN CRITERIA AND MATERIALS 9

Development of High Rise Structures - General Planning Considerations - Design philosophies - Materials used for Construction - High Strength Concrete - High Performance Concrete - Self Compacting Concrete - Glass - High Strength Steel.

UNIT – II : LOADING 9

Gravity Loading - Dead Load - Live Load - Live load reduction technique - Impact Load - Construction Load - Sequential Loading. Lateral Loading - Wind load - Earthquake Load. Combination of Loads.

UNIT – III : BEHAVIOUR OF VARIOUS STRUCTURAL SYSTEMS 9

Factors affecting growth, Height and Structural form. High rise behaviour of Various structural systems - Rigid frames, braced frames, Infilled frames, shear walls, coupled shear walls, wall-frames, tubular structures, cores, outrigger - braced and hybrid mega systems.

UNIT – IV : ANALYSIS AND DESIGN 9

Modeling for approximate analysis, Accurate analysis and reduction techniques, Analysis of buildings as total structural system considering overall integrity and major subsystem interaction, Analysis for member forces, drift and twist, computerised general three dimensional analysis.

UNIT – V : STABILITY OF TALL BUILDINGS 9

Overall buckling analysis of frames, wall-frames, Approximate methods, second order effects of gravity of loading, P-Delta analysis, simultaneous first-order and P-Delta analysis, Translational, Torsional instability, out of plumb effects, stiffness of member in stability, effect of foundation rotation.

TOTAL:45 Hours

OUTCOME:

At the end of this course the student should have an understanding on the

- behaviour of tall buildings subjected to lateral building.
- Rudimentary principles of designing tall buildings as per the existing codes.
- Stability evaluation of tall buildings with respect to various factors

TEXT BOOKS:

1. Bryan Stafford Smith, Alex coull, “Tall Building Structures, Analysis and Design”, John Wiley and Sons, Inc., 1991.

2. Taranath B.S., “Structural Analysis and Design of Tall Buildings”, McGraw Hill, 2011.

REFERENCES:

1. Lin.T.Y, Stotes Burry.D, “Structural Concepts and systems for Architects and Engineers”, John Wiley, 1988.
2. Lynn S.Beedle, “Advances in Tall Buildings”, CBS Publishers and Distributors, Delhi, 1986.
3. Wolfgang Schueller "High Rise Building Structures", John Wiley and Sons, New York 1977.

22PTCEE35 SMART MATERIALS AND SMART STRUCTURES 3 0 0 3

OBJECTIVE

This course is designed to give an insight into the latest developments regarding smart materials and their use in structures. Further, this also deals with structures which can self adjust their stiffness with load.

UNIT – I : INTRODUCTION 9

Introduction to smart materials and structures – Instrumented structures functions and response – Sensing systems – Self diagnosis – Signal processing consideration – Actuation systems and effectors.

UNIT – II : MEASURING TECHNIQUES 9

strain measuring techniques using electrical strain gauges, types – Resistance – Capacitance – Inductance – Wheatstone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain Rosettes.

UNIT – III : SENSORS 9

Sensing technology – Types of sensors – Physical measurement using piezo electric strain measurement – Inductively read transducers – The LVDT – Fiber optic Techniques.Chemical and Bio-Chemical sensing in structural assessment – Absorptive chemical sensors – Spectroscopes – Fibre optic chemical sensing systems and distributed measurement.

UNIT – IV : ACTUATORS 9

Actuator techniques – Actuator and actuator materials – Piezoelectric and electrostrictive material – Magnetostructure material – Shape memory alloys – Electro orheological fluids– Electromagnetic actuation – Role of actuators and actuator materials.

UNIT – V : SIGNAL PROCESSING AND CONTROL SYSTEMS 9

Data acquisition and processing – Signal processing and control for smart structures – Sensors as geometrical processors – Signal processing – Control system – Linear and Non-linear.

TOTAL:45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Acquire thorough knowledge on instrumentation for measuring strains, load and deflection
- Have an insight into actuator techniques, SMA, signal processing and control system

TEXT BOOKS:

1. L. S. Srinath – *Experimental Stress Analysis* – Tata McGraw-Hill, 1998

2. Brain Culshaw – *Smart Structure and Materials Artech House* – Borton. London-1996

REFERENCES:

1. J. W. Dally & W. F. Riley – *Experimental Stress Analysis* – Tata McGraw-Hill,1998

22PTCEE36 PREFABRICATED STRUCTURES 3 0 0 3

OBJECTIVE

At the end of this course the student shall be able to appreciate modular construction, industrialised construction and shall be able to design some of the prefabricated elements and also have the knowledge of the construction methods using these elements.

UNIT – I : INTRODUCTION 9

Need for prefabrication – Principles – Materials – Modular coordination – Standarization – Systems – Production – Transportation – Erection.

UNIT – II : PREFABRICATED COMPONENTS 9

Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls

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

Joints for different structural connections – Dimensions and detailing – Design of expansion joints

UNIT – V : DESIGN FOR ABNORMAL LOADS 9

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse.

TOTAL : 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Understand the principles of prefabrication behavior and construction of structural components
- Design the joints in structural connections and have a knowledge of codal provisions to design the structure for abnormal loads

TEXT BOOKS:

1. CBRI, *Building materials and components*, India, 1990

2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., *Knowledge based processplanning*

For construction and manufacturing, Academic Press Inc., 1994

REFERENCES:

1. Koncz T., *Manual of precast concrete construction, Vols. I, II and III*, Bauverlag,GMBH, 1971.

2. *Structural design manual, Precast concreteconnection details*, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 1978.

22PTCEE37 WIND ENGINEERING 3 0 0 3

OBJECTIVE

At the end of this course the student should be able to appreciate the forces generated on structures due to normal wind as well as gusts. He should also be able to analyse the dynamic effects created by these wind forces.

UNIT – I : INTRODUCTION 9

Terminology – Wind Data – Gust factor and its determination - Wind speed variation with height – Shape factor – Aspect ratio – Drag and lift.

UNIT – II : EFFECT OF WIND ON STRUCTURES 9

Static effect – Dynamic effect – Interference effects (concept only) – Rigid structure – Aeroelastic structure (concept only).

UNIT – III : EFFECT ON TYPICAL STRUCTURES 9

Tail buildings – Low rise buildings – Roof and cladding – Chimneys, towers and bridges.

UNIT – IV : APPLICATION TO DESIGN 9

Design forces on multistorey building, towers and roof trusses.

UNIT – V : INTRODUCTION TO WIND TUNNEL 9

Types of models (Principles only) – Basic considerations – Examples of tests and their use.

TOTAL : 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Identify the forces generated on structures due to normal wind as well as gusts
- Analyse the dynamic effects created by these wind forces.

TEXT BOOKS:

1. Peter Sachs, “Wind Forces in Engineering, Pergamon Press, New York, 1992.
2. Lawson T.V., Wind Effects on Buildings, Vols. I and II, Applied Science and Publishers, London, 1993.

REFERENCES:

1. Devenport A.G., “Wind Loads on Structures”, Division of Building Research, Ottowa,

1990.

2. Wind Force on Structures – Course Notes, Building Technology Centre, Anna University, 1995.

22PTCEE38 DESIGN OF COMPOSITE STRUCTURES 3 0 0 3

OBJECTIVE

This subject develop an understanding of the behaviour and design study of Steel concrete composite elements and structures.

UNIT – I : INTRODUCTION 9

Introduction to steel - concrete composite construction – Composite action – Serviceability and - Construction issues.

UNIT – II : DESIGN OF CONNECTIONS 9

Shear connectors – Types – Design of connections in composite structures – Degree of shear connection – Partial shear interaction.

UNIT – III : DESIGN OF COMPOSITE MEMBERS 9

Design of composite beams, slabs, columns, beam – columns - design of composite trusses.

UNIT – IV : COMPOSITE BOX GIRDER BRIDGES 9

Introduction - behaviour of box girder bridges - design concepts.

UNIT – V : CASE STUDIES 9

Case studies on steel - concrete composite construction in buildings - seismic behaviour of composite structures.

TOTAL : 45 Hours

OUTCOME:

- At the end of this course students will be in a position to design composite beams, columns, trusses and box-girder bridges including the related connections.
- They will get exposure on case studies related to steel-concrete constructions of buildings.

TEXT BOOKS:

1. Johnson R.P., “Composite Structures of Steel and Concrete Beams, Slabs, Columns

and Frames for Buildings”, Vol.I, Blackwell Scientific Publications, 2004.

2. Oehlers D.J. and Bradford M.A., “Composite Steel and Concrete Structural Members,

Fundamental behaviour”, Pergamon press, Oxford, 1995.

REFERENCES:

1. Owens.G.W and Knowles.P, ”Steel Designers Manual”, Steel Concrete Institute(UK),

Oxford Blackwell Scientific Publications, 1992.

22PTCEE39 COASTAL STRUCTURES 3 0 0 3

OBJECTIVE

To study the concept of wave theories, forces and design of jacket towers, pipes and cables**.**

UNIT – I : WAVE THEORIES 9

Wave generation process, small, finite amplitude and nonlinear wave theories.

UNIT – II : FORCES OF OFFSHORE STRUCTURES 9

Wind forces, wave forces on small bodies and large bodies - current forces and use of Morison equation.

UNIT – III : OFFSHORE SOIL AND STRUCTURE MODELLING 9

Different types of offshore structures, foundation modeling, fixed jacket platform structural modeling.

UNIT – IV : ANALYSIS OF OFFSHORE STRUCTURES 9

Static method of analysis, foundation analysis and dynamics of offshore structures.

UNIT – V : DESIGN OF OFFSHORE STRUCTURES 9

Design of platforms, helipads, Jacket tower, analysis and design of mooring cables and pipe lines.

TOTAL : 45 Hours

OUTCOME:

On completion of this course students will be able to

- determine the forces due to ocean waves
- analyze and design offshore structures
- construct platform, helipads, jackets, towers etc.,

TEXT BOOKS:

1. API RP 2A-WSD, Planning, Designing and Constructing Fixed Offshore Platforms - Working Stress Design - API Publishing Services, 2005

2. Chakrabarti, S.K., Handbook of Offshore Engineering by, Elsevier, 2005.

3. Chakrabarti, S.K., Hydrodynamics of Offshore Structures, WIT press, 2001.

REFERENCES:

1. Dawson.T.H., Offshore Structural Engineering, Prentice Hall Inc Englewood Cliffs, N.J. 1983.

2. James F. Wilson, Dynamics of Offshore Structures, John Wiley & Sons, Inc, 2003.

3. Reddy, D.V. and Arockiasamy, M., Offshore Structures, Vol.1 and Vol.2, Krieger Publishing Company, 1991.

4. Turgut Sarpkaya, Wave Forces on Offshore Structures, Cambridge University Press, 2010.

22PTCEE40 DYNAMICS AND EARTHQUAKE RESISTANT DESIGN OF STRUCTURES 3 0 0 3

OBJECTIVE

The objective of this course is to introduce to the student the phenomena of earthquakes, the process, measurements and the factors that affect the design of structures in seismic areas. This objective is achieved through imparting theory of vibrations necessary to understand and analyse the dynamic forces caused by earthquakes and structures. The student is also taught the codal provisions of earthquake resistant design of structures.

UNIT – I : THEORY OF VIBRATIONS 9

Difference between static forces and dynamic excitation – Concept of inertia and damping – Types of Damping – Degrees of freedom – SDOF Idealisation – Equations of motion of SDOF system for mass as well as base excitation – Free vibration of SDOF system – Response to harmonic excitation – Impulse and response to unit impulse – Duhamel integral

UNIT – II : MULTIPLE DEGREE OF FREEDOM SYSTEM 9

Two degree of freedom system – Normal modes of vibration – Natural frequencies - Mode shapes - Introduction to MDOF systems – Decoupling of equations of motion – Concept of mode superposition (No derivations).

UNIT – III : ELEMENTS OF SEISMOLOGY 9

Causes of Earthquake – Geological faults – Tectonic plate theory – Elastic rebound – Epicentre – Hypocentre – Primary, shear and Raleigh waves – Seismogram – Magnitude and intensity of earthquakes – Magnitude and Intensity scales – Spectral Acceleration - Information on some disastrous earthquakes

UNIT – IV : RESPONSE OF STRUCTURES TO EARTHQUAKE 9

Response and design spectra – Design earthquake – Concept of peak acceleration – Site specific response spectrum – Effect of soil properties and damping – Liquefaction of soils – Importance of ductility – Methods of introducing ductility into RC structures.

UNIT – V : DESIGN METHODOLOGY 9

IS 1893, IS 13920 and IS 4326 – Codal provisions – Design as per the codes – Base isolation techniques – Vibration control measures – Important points in mitigating effects of earthquake on structures.

TOTAL: 45 Hours

OUTCOME :

At the end of the course, the student will be able to:

- Apply the basics of Earthquake Engineering
- Demonstrate the dynamics of structural system under earthquake load
- Analyze the influence of the structural / geometrical design in building characteristics
- Demonstrate the cyclic loading behaviour of RC steel and pre-stressed concrete elements
- Apply codal provisions on different types of structures

TEXT BOOKS:

1. Damodarasamy S.R. and Kavitha S. Basics of Structural Dynamics and Aseismic
Design, PHI learning private Ltd, New Delhi-1, 2009.

REFERENCES:

1. Paz, M., Structural Dynamics – Theory & Computation, CSB Publishers & Distributors, Darga Ganj, New Delhi-2, 2004.
2. Chopra, A.K., Dynamics of Structures – Theory and Applications to Earthquake Engineering, Second Edition, Pearson Education, 2003.
3. Pankaj Agarwal and Manish Shrikhante. Earthquake Resistant Design of Structures, Prentice-Hall of India private Limited, New Delhi – 110001, 2007.
4. Dowrick, D.J. Earthquake Resistant Design, John Wiley & Sons, London, 1977 NPEEE Publications

22PTCEE41 INDUSTRIAL STRUCTURES 3 0 0 3

OBJECTIVE

This course deals with some of the special aspects with respect to Civil Engineering structures in industries. At the end of this course the student shall be able to design the important industrial structures.

UNIT – I : PLANNING 9

Classification of Industries and Industrial structures – General requirements for industries like cement, chemical and steel plants – Planning and layout of buildings and components.

UNIT – II : FUNCTIONAL REQUIREMENTS 9

Lighting – Ventilation – Accounts – Fire safety – Guidelines from factories act.

UNIT – III : DESIGN OF STEEL STRUCTURES 9

Industrial roofs – Crane girders – Mill buildings – Design of Bunkers and Silos

UNIT – IV : DESIGN OF R.C. STRUCTURES 9

Silos and bunkers – Chimneys – Principles of folded plates and shell roofs

UNIT – V : PREFABRICATION 9

Principles of prefabrication – Prestressed precast roof trusses- Functional requirements for Precast concrete units

TOTAL : 45 Hours

OUTCOME :

On completion of this course student will be able to

- plan industrial structures for functional requirements.
- They will be able to design various structures such as Bunkers, Silos, Cooling Towers, Chimneys, and Transmission Towers with required foundations.

TEXT BOOKS:

1. Duggal S.K., *Limit State Design of Steel Structures*, Tata McGraw-Hill Publishing Company , New Delhi, 2010.
2. Subramanian N., *Design of Steel Structures*, First edition, OXFORD university press, 2008
3. *Reinforced Concrete Structural elements* – P. Purushothaman
4. Pasala Dayaratnam – *Design of Steel Structure – 1990*

REFERENCES:

1. Henn W. *Buildings for Industry, vols.I and II*, London Hill Books, 1995
2. *Handbook on Functional Requirements of Industrial buildings*, *SP32 – 1986*, Bureauof
   Indian Standards, New Delhi 1990
3. *Course Notes on Modern Developments in the Design and Construction ofIndustrial*

Structures, Structural Engineering Research Centre, Madras, 1982

22PTCEE42 FERRO CEMENT TECHNOLOGY 3 0 0 3

OBJECTIVE

To impart knowledge on the material properties of ferrocement, construction methods and design of ferrocement structures in building construction, hydraulic structures and soil retaining structures.

UNIT – I : FERROCEMENT 9

Ferrocement – Definition, Applications of ferrocement , Constituent materials of ferrocement – Cement mortar matrix, skeletal steel, Mesh reinforcement, Distinct characteristics of Ferrocement versus Reinforced concrete , Similarities between Ferrocement and Reinforced concrete, Ferrocement versus Fiber reinforced polymeric composites, Ferrocement as a laminated composite, Advantages of ferrocement as a construction material.

UNIT – II: MECHANICAL PROPERTIES AND CONSTRUCTION METHODS 9

Mechanical properties – Distinct behaviour of ferrocement in tension - and typical features affecting design. Properties under static and dynamic loading. Shrinkage and creep. Testing of ferrocement. Methods of constructing ferrocement structures. Standardizing method of construction. Planning the work. Fabricating skeleton, tying meshes and mortaring. Curing. Maintenance. Protective surface treatments. Damage to ferrocement structures.

UNIT – III : STRENGTH THROUGH SHAPE AND DESIGN 9

Strength through shape. Design of structure based on form and shape. Forms in nature. Various structural forma and their behavior. Typical strengths of different materials. Comparative study of various forms.Design of ferrocement structures. Design, analysis and optimization. Special design considerations for ferrocement. Typical features of ferrocement affecting design. Conventional design methods like working stress, load factor, applied to ferrocement. Design based on equivalent area method for compression, tension and flexural members. Specific surface method and crack control method, Design of structures subjected to membrane stresses. Design of shaped structures in ferrocement like stiffened plates, arch faced walls, stiffened cavity walls and hollow floors and beams. Design of forms like ‘T’, ‘U’ ‘T’ ‘+’ ‘L’.

UNIT – IV : COST ANALYSIS AND FERROCEMENT IN BUILDING CONSTRUCTION 9

Cost analysis: Factors governing cost analysis. Special considerations for ferrocement structures. Cost comparison with conventional construction. Specifications for ferrocement structures. Quantity analysis of material and labour for feroocement items. Cost and value of ferrocement construction.
Ferrocement in building construction. Ferrocement in foundations, walls, floors roofs. Ferrocement single wall construction. Design and construction of houses with cavity walls, hollow floors and hollow beams. Staircases and other building accessories.Earthquake resisting structures. Special characteristics of ferrocement to resist shock loading. Design and construction of quake proof structures.

UNIT – V : HYDRAULIC AND SOIL RETAINING STRUCTURES IN FERROCEMNENT 9

Hydraulic structures. Why ferrocement? Water retaining structures. Storage tanks of various types. Structures across streams. Ferrocement in layered form used for lining, water proofing and surface coating.
Soil retaining structures. Types of retaining walls and their comparison with ferrocement arch faced wall. Design and method of fabrication and casting. Ferrocement counterfort retaining wall. Ferrocement containers for storing granular materials.

TOTAL :45 Hours

OUTCOME :
Student will acquire knowledge on

- Properties and behaviour of ferrocement
- Design hydraulic and soil retaining structures
- Cost analysis using ferrocement construction

TEXT BOOKS:

1.State-of-the-art report and guide for Design,Construction and Repairs of Ferrocement;ACI committee Report. No ACI549R- 88 and ACI 549.1R.88.Published by American Concrete Institute, Detroit, USA
2. FerrocementAuthors: B R Paul and R P Pama. Published by International Ferrocement Information Centre. A.I.T.Bangkok, Thailand.
3.Ferrocement and laminated cementitious composites Author: A E Naaman. Publisher: Techno-press, Ann Arbor, Michigan, U S A.
4.Ferrocement- Materials and applications; Publication SP 61, A C I Detroit. U S A

REFERENCES:

1. Ferrocrete Technology- A Construction Manual. Author: Dr B N Divekar. Published by the Author.

2. Chapter 1 titled ‘Ferrocement’ by S P Shah and P N Balaguru. in book ‘Concrete Technology and Design Vol II Editor; R N Swamy.

3. Proceedings of International Symposiums on ‘ Ferrocement and thin reinforced composites.- Ferro 1 to Ferro 10.Available with International Ferrocement Information Centre, A I T Bangkok, Thailand.

22PTCEE43 FINITE ELEMENT METHOD 3 0 0 3

OBJECTIVE

At the end of this course the student shall have a basic knowledge of finite element method and shall be able to analyse linear elastic structures that he has studied about in core courses, using finiteelement method.

UNIT– I ELEMENTS OF ELASTICITY 9

Basic principles of structural mechanics – Equations of equilibrium – Strain displacement relations – Stress strain relations – Plane stress and plane strain cases – Principles of Virtual work and minimum potential energy.

UNIT– II DIRECT STIFFNESS METHOD 9

Steps in direct method of FEA – Element stiffness matrix – Global stiffness matrix – Boundary conditions – Problems on simple beams and Trusses.

UNIT– III FINITE ELEMENTS 9

Discretization - Basic element shapes - Element properties – Node numbering procedure – Convergence requirements – Generalised co-ordinates – Natural co-ordinates – Shape functions for linear & quadratic models – Stiffness matrix – Nodal load vector – Static condensation – Simple problems.

UNIT– IV INTRODUCTION TO ISOPARAMETRIC ELEMENTS 9

Concept of sub, iso, super parametric elements – Gauss quadrature – Examples in one and two dimensional elements

UNIT– V SOLUTION TECHNIQUES 9

Different solvers – Variational approach – Weighted mean residual methods like Collocation method, Subdomain method, Galerkin method and Least square method – Simple problems only.

TOTAL:45 Hours

TEXT BOOKS

1. Krishnamoorthy C.S., “Finite Element Analysis- Theory and Programming”, Second Edition, Tata McGraw Hill Publishing Co.,2004.
2. Tirupathi R. Chandrupatla and Ashok D. Belugundu , “Introduction to Finite Elements in Engineering”, Third Edition, Prentice Hall India Pvt Ltd, 2011.
3. P.Seshu, “Textbook of Finite Element Analysis”, Prentice Hall India Pvt Ltd, 2008.

REFERENCES

1. Cook Robert. D, “Concepts and Applications of Finite Element Analysis”, John Wiley and Sons, INC,1995.
2. Rajasekaran.S., “Finite Element Analysis in Engineering Design”, Wheeler Publishing,2000.
3. S.S.Rao, “The Finite Element Method in Engineering”, Buttersworth-Heinemann publishing, 2000.

22CEE44 EXPERIMENTAL TECHNIQUES AND INSTRUMENTATION 3 0 0 3

OBJECTIVE :To make students aware of various measurement techniques and experimental planning and procedures adopted in laboratory.

UNIT – I : STRAIN GAUGES 9

Definition of Gauge length, sensitivity and range – Characteristics of an ideal strain gauge – Different types of mechanical strain gauges for use in metal and concrete specimens – Optical strain gauge – Acoustic strain gauge – Pneumatic strain gauge – Merits and demerits.

UNIT – II: ELECTRICAL STRAIN GAUGES 9

Inductance, capacitance and piezo-electric gauges – Bonded and unbounded resistance gauges and their application in stress analysis – Fixing technique and measurement of strains – Rosettes – Determination of principal strains using rosettes – Use of Murphy‟s construction for drawing circle of strains – Mohr‟s stress circle – Analytical solution.

UNIT – III : PHOTOELASTICITY 9

Principles – Maxwell‟s stress optic law – Plane and circularly polarised light and their use in photo elasticity – Polariscopes – Diffusion type, lense type and reflection type polariscopes – Isochromatics and Isoclinics – Model materials – Calibration methods for finding material fringe value – Model fringe value – Examples of beam flexure and diametrically loaded circular plates.

UNIT – IV : MODEL ANALYSIS 9

Direct and indirect models – Laws of structural similitude – Choice of scales – Limitation of model studies - Buckingham piktheorem – Dimensional analysis – Model materials – Begg‟s deformeter and its use in model analysis – Simple design of models for direct and indirect model analysis.

UNIT – V : BRITTLE COATINGS 9

Historical review – Stress Coat – Ceramic coatings – Application – Moire fringe method of stress analysis.

TOTAL : 45 Hours

OUTCOME:

Students will be able to

- Select the appropriate strain gauges for strain measurements
- Principles behing the photo elasticity
- Knowledge in model analysis and predict the behaviour of prototypes.

TEXT BOOKS:

1. T.K.Roy, "Experimental Analysis of Stress and Strains", S.Chand and Company Ltd.,
New Delhi, 2000.
2. Hetenyi. M., Hand Book of Experimental Stress Analysis, John Wiley and Sons Inc.,
New York, 1966.

REFERENCES:

1. J.W.Dally and W.F.Riley, "Experimental Stress Analysis", McGraw Hill Book, New York, 1990.
2. L.S. Srinath, "Experimental Stress Analysis", Tata-McGraw Hill Book Company, New Delhi, 2001.
3. Sadhu Singh, "Experimental Stress Analysis", Khanna Publishers, New Delhi, 2004.