

ANNA UNIVERSITY, CHENNAI

AFFILIATED INSTITUTIONS

R - 2009

I TO VII SEMESTERS CURRICULA AND SYLLABI

B.E. (PART TIME) CIVIL ENGINEERING

SEMESTER I

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1	PTMA 2111	<u>Applied Mathematics</u>	3	0	0	3
2	PTPH 2111	<u>Applied Physics</u>	3	0	0	3
3	PTCY 2111	<u>Applied Chemistry</u>	3	0	0	3
4	PTGE 2111	<u>Fundamentals of Computing</u>	3	0	0	3
5	PTCE 2201	<u>Strength of Materials-I</u>	3	0	0	3
TOTAL			15	0	0	15

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1	PTMA 2211	<u>Transforms and Partial Differential Equations</u>	3	0	0	3
2	PTCE 2202	<u>Fluid Mechanics</u>	3	0	0	3
3	PTCE 2252	<u>Strength of Materials - II</u>	3	0	0	3
4	PTCE 2254	<u>Surveying</u>	3	0	0	3
5	PTCE 2257	<u>Survey Practicals</u>	0	0	4	2
TOTAL			12	0	4	14

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1	PTCE 2302	<u>Structural Analysis – I</u>	3	0	0	3
2	PTGE 2021	<u>Environmental Science and Engineering</u>	3	0	0	3
3	PTCE 2251	<u>Soil Mechanics</u>	3	0	0	3
4	PTCE 2255	<u>Highway Engineering</u>	3	0	0	3
5	PTCE 2208	<u>Computer Aided Building Drawing (Practical)</u>	0	0	4	2
TOTAL			12	0	4	14

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1	PTCE 2352	<u>Design of Steel Structures</u>	3	0	0	3
2	PTCE2353	<u>Construction Planning & Scheduling</u>	3	0	0	3
3	PTCE 2351	<u>Structural Analysis – II</u>	3	0	0	3
4	PTCE 2253	<u>Applied Hydraulics Engineering</u>	3	0	0	3
5	PTCE 2303	<u>Railways Airports and Harbour Engineering</u>	3	0	0	3
TOTAL			15	0	0	15

SEMESTER V

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1	PTCE 2401	<u>Design of Reinforced Concrete and Brick Masonry Structures</u>	3	0	0	3
2	PTCE2402	<u>Estimation and Quantity Surveying</u>	3	0	0	3
3	PTCE2403	<u>Basics of Dynamics and Aseismic Design</u>	3	0	0	3
4	PTCE 2305	<u>Foundation Engineering</u>	3	0	0	3
5	E1*	<u>Elective – I</u>	3	0	0	3
TOTAL			15	0	0	15

SEMESTER VI

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1	PTCE 2404	<u>Prestressed Concrete Structures</u>	3	0	0	3
2	PTCE 2301	<u>Irrigation Engineering</u>	3	0	0	3
3	PTMG2351	<u>Principles of Management</u>	3	0	0	3
4	E2	<u>Elective - II</u>	3	0	0	3
5	E3	<u>Elective - III</u>	3	0	0	3
TOTAL			15	0	0	15

SEMESTER VII

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1	PTCE2451	<u>Engineering Economics and Cost Analysis</u>	3	0	0	3
2	E3	<u>Elective - IV</u>	3	0	0	3
3	PTCE 2453	<u>Project Work</u>	0	0	12	6
TOTAL			6	0	12	12

TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE = 100
LIST OF ELECTIVES

ELECTIVE - I

Code No.	Course Title	L	T	P	C
PTCE2021	<u>Hydrology</u>	3	0	0	3
PTCE2022	<u>Cartography</u>	3	0	0	3
PTCE2023	<u>Electronic Surveying</u>	3	0	0	3
PTCE2024	<u>Remote Sensing Techniques and GIS</u>	3	0	0	3
PTCE2025	<u>Architecture</u>	3	0	0	3
PTGE2022	<u>Total Quality Management</u>	3	0	0	3
PTGE2023	<u>Fundamentals of Nanoscience</u>	3	0	0	3
PTGE2025	<u>Professional Ethics in Engineering</u>	3	0	0	3
PTGE2071	<u>Intellectual Property Rights (IPR)</u>	3	0	0	3
PTGE2072	<u>Indian Constitution and Society</u>	3	0	0	3

ELECTIVE - II

Code No.	Course Title	L	T	P	C
PTCE2026	<u>Traffic Engineering and Management</u>	3	0	0	3
PTCE2027	<u>Housing Planning and Management</u>	3	0	0	3
PTCE2028	<u>Ground Water Engineering</u>	3	0	0	3
PTCE2029	<u>Management of Irrigation Systems</u>	3	0	0	3
PTCE2030	<u>Coastal Zone Management</u>	3	0	0	3
PTCE2031	<u>Water Resources Engineering</u>	3	0	0	3
PTCE2032	<u>Pavement Engineering</u>	3	0	0	3
PTCE2033	<u>Ground Improvement Techniques</u>	3	0	0	3
PTGE2073	<u>Contract Laws and Regulations</u>	3	0	0	3

ELECTIVE – III

Code No.	Course Title	L	T	P	C
PTCE2034	<u>Introduction to Soil Dynamics and Machine Foundations</u>	3	0	0	3
PTCE2035	<u>Rock Engineering</u>	3	0	0	3
PTCE2036	<u>Environmental Impact Assessment of Civil Engineering Projects</u>	3	0	0	3
PTCE2037	<u>Industrial Waste Management</u>	3	0	0	3
PTCE2038	<u>Air Pollution Management</u>	3	0	0	3
PTCE2039	<u>Municipal Solid Waste Management</u>	3	0	0	3
PTCE2040	<u>Ecological Engineering</u>	3	0	0	3

ELECTIVE – IV

Code No.	Course Title	L	T	P	C
PTCE2041	<u>Bridge Structures</u>	3	0	0	3
PTCE2042	<u>Storage Structures</u>	3	0	0	3
PTCE2043	<u>Design of Plate and Shell Structures</u>	3	0	0	3
PTCE2044	<u>Tall Buildings</u>	3	0	0	3
PTCE2045	<u>Prefabricated structures</u>	3	0	0	3
PTCE2046	<u>Wind Engineering</u>	3	0	0	3
PTCE2047	<u>Computer Aided Design of Structures</u>	3	0	0	3
PTCE2048	<u>Industrial Structures</u>	3	0	0	3
PTCE2049	<u>Smart Structures and smart Materials</u>	3	0	0	3
PTCE2050	<u>Finite Element Techniques</u>	3	0	0	3
PTCE2071	<u>Repair and Rehabilitation of Structures</u>	3	0	0	3

UNIT I MATRICES

9

Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors – Cayley – Hamilton Theorem – Diagonalization of matrices - Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms .

UNIT II FUNCTIONS OF SEVERAL VARIABLES

9

Partial derivatives – Homogeneous functions and Euler’s theorem – Total derivative – Differentiation of implicit functions – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor’s series for functions of two variables - Maxima and minima of functions of two variables.

UNIT III ANALYTIC FUNCTION

9

Analytic functions – Necessary and sufficient conditions for analyticity – Properties – Harmonic conjugates – Construction of analytic function – Conformal Mapping – Mapping by functions $w = a + z$, az , $1/z$, - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION

9

Line Integral – Cauchy’s theorem and integral formula – Taylor’s and Laurent’s Series – Singularities – Residues – Residue theorem – Application of Residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

UNIT V LAPLACE TRANSFORMS

9

Existence conditions – Transforms of elementary functions – Basic properties – Transforms of derivatives and integrals – Initial and Final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear ordinary differential equations with constant coefficients.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Grewal B.S., Higher Engineering Mathematics (40th Edition), Khanna Publishers, Delhi (2007).
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill Co. Ltd., New Delhi (2007).

REFERENCES

1. Iyn James, Advanced Modern Engineering Mathematics, Pearson Education (2007).
2. Veerarajan, T., Engineering Mathematics (For First Year), Tata McGraw-Hill Pub. pvt Ltd., NewG Delhi (2006).

UNIT I ULTRASONICS**9**

Introduction – Production – magnetostriction effect - magnetostriction generator- piezoelectric effect - piezoelectric generator- Detection of ultrasonic waves properties – Cavitations - Velocity measurement – acoustic grating - Industrial applications – drilling, welding, soldering and cleaning – SONAR - Non Destructive Testing – pulse echo system through transmission and reflection modes - A, B and C –scan displays, Medical applications - Sonograms

UNIT II LASERS**9**

Introduction – Principle of Spontaneous emission and stimulated emission. Population inversion, pumping. Einstein's A and B coefficients - derivation. Types of lasers – He-Ne, CO₂, Nd-YAG, Semiconductor lasers - homojunction and heterojunction (Qualitative)- Industrial Applications - Lasers in welding, heat treatment and cutting – Medical applications - Holography (construction and reconstruction).

UNIT III FIBER OPTICS & APPLICATIONS**9**

Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle - Types of optical fibres (material, refractive index, mode) – Double crucible technique of fibre drawing - Splicing, Loss in optical fibre – attenuation, dispersion, bending - Fibre optical communication system (Block diagram) - Light sources - Detectors - Fibre optic sensors – temperature and displacement - Endoscope.

UNIT IV QUANTUM PHYSICS**9**

Black body radiation – Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh – Jeans' Law from Planck's theory – Compton effect - Theory and experimental verification – Matter waves – Schrödinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one-dimensional box - Electron microscope - Scanning electron microscope - Transmission electron microscope.

UNIT V CRYSTAL PHYSICS**9**

Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – 'd' spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – NaCl, ZnS, diamond and graphite structures – Polymorphism and allotropy - Crystal defects – point, line and surface defects- Burger vector.

TOTAL: 45 PERIODS**TEXT BOOKS:**

1. Palanisamy, P.K., 'Engineering Physics' Scitech publications, Chennai, (2008).
2. Arumugam M. ' Engineering Physics', Anuradha Publications, Kumbakonam, (2007)
3. Sankar B.N and Pillai S.O. 'A text book of Engineering Physics', New Age International Publishers, New Delhi, 2007.

REFERENCES

1. R. K. Gaur and S.C. Gupta, 'Engineering Physics' Dhanpat Rai Publications, New Delhi (2003)
2. M.N. Avadhanulu and PG Kshirsagar, 'A Text book of Engineering Physics', S.Chand and company, Ltd., New Delhi, 2005.
3. Serway and Jewett, 'Physics for Scientists and Engineers with Modern Physics', 6th Edition, Thomson Brooks/Cole, Indian reprint (2007)

UNIT I WATER TREATMENT AND POLLUTION CONTROL 9

Treatment of water –impurities and disadvantages of hard water-Domestic and Industrial treatment - zeolite and ion exchange processes-Portable water-Boiler feed water –conditioning of boiler feed water. Scale and sludge formation –prevention – caustic embrittlement-boiler corrosion–priming and foaming Sewage treatment–Primary, secondary and tertiary treatment–significance of DO, BOD and COD-desalination –reverse osmosis. Control of water,air and land pollution.

UNIT II FUELS 9

Classification of fuels-Proximate and ultimate analysis of coal- coke manufacture-Otto Hoffman by product method-cracking-thermal and catalytic (fixed bed and fluidized bed)-petroleum-refining-fractions-composition and uses synthetic petrol-fischer drops methods- Bergius process- knocking-octane number and cetane number-Preparation, composition and uses of producer gas , water gas and natural gas. Flue gas analysis- Orsat apparatus- gross and net calorific values- calculation of minimum requirement of air(simple calculations)- Explosive range –spontaneous ignition temperature

UNIT III THERMODYNAMICS AND SURFACE CHEMISTRY 9

Second law of thermodynamics-entropy and its significance- criteria for spontaneity-free energy-Gibbs, Helmholtz and Gibbs-Helmholtz equation-applications and problems – Adsorption –types of adsorption- adsorption of gases on solids-adsorption isotherm-Freundlich and Langmuir isotherms-adsorption of solutes from solutions- applications

UNIT IV ELECTROCHEMISTRY - CORROSION AND CATALYSIS 9

Reversible and irreversible cells-electrode potentials-types of electrodes-cell reactions-Nernst equations- electrochemical and galvanic series-fuel cells and solar cells-corrosion-chemical and electrochemical-factors affecting corrosion-sacrificial anode-impressed current cathodic protection-surface treatment and protective coating- Catalysis –classification-characteristics of catalysis – auto catalysis- enzyme catalysis

UNIT V POLYMERS-COMPOSITES AND NANOCHEMISTRY 9

Polymers-definition-classification-thermoplastics and thermosetting plastics differences Preparation, properties and uses of polystyrene, bakelite, PET, polyurethane, Teflon, ureaformaldehyde, polycarbonates-Elastomers-Preparation, properties of Buna-S, nitrile, neoperene and butyl rubber, silicon rubber. Composites-FRP. Nanochemistry-introduction to nanochemistry- preparation and properties of nonmaterial-nano rods, nano wires-nanotubes-carbon nanotubes and their applications.

TOTAL : 45 PERIODS**TEXT BOOKS:**

1. Dhara S S A text book of Engineering Chemistry, S.Chand & Co Ltd, New Delhi,2002
2. Jain. P.C and Monica Jain, Engineering Chemistry,Dhanpet Rai & Sons, New Delhi 2001

REFERENCES:

1. Puri B R.,Sharma L R and Madhan S. Pathania, Principles of Physical Chemistry, Shoban Lal Nagin Chand & Co. Jalandar-2000.
2. G.B. Sergeev, Nanochemistry.Elsevier Science, New York,2006
3. V.R.Gowarikar, N.V.Viswanathan and Jayadev Sreedhar, Polymer Science, Wiley Eastern Limited, Madras (2006).

AIM:

- To introduce the basics of computing and the fundamentals of C programming.

OBJECTIVES:

- To introduce the fundamentals of computing systems.
- To introduce the concepts of internet and WWW.
- To teach programming in C.

UNIT I**9**

Computer systems – Exploring computers – Inside the system – Processing data – CPUs – Types of storage devices - Operating systems basics – Networking basics.

UNIT II**9**

The internet and the WWW – Internet services – connecting to the internet - Working with applications software – productivity software – graphics and multimedia – Data base Management systems – Creating computer program.

UNIT III**9**

C programming fundamentals – compilation process – variables – Data types – Expressions – looping – decisions.

UNIT IV**9**

Arrays - Working with functions – structures – character strings – pre-processor.

UNIT V**9**

Pointers – Dynamic memory allocation – linked list - Applications

TOTAL: 45 PERIODS**TEXT BOOKS:**

1. Peter Norton, "Introduction to Computers", Sixth Edition, Tata McGraw Hill, 2007.
2. Stephen G. Kochan, "Programming in C", Third Edition, Pearson Education, 2007.

REFERENCES:

1. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2006
2. Ashok N. Kamthane, "Computer programming", Pearson Education, 2007.
Kenneth A. Reek, "Pointers on C", Pearson Education, 2007.
3. Dromey,R.G, "How to solve it by Computer", Pearson Education, 2007.

OBJECTIVE:

- Enable the student to understand the behaviour of deformable structural elements, subjected to different types of loadings

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 9

Rigid and deformable bodies – Stability, strength and stiffness - Axial and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Biaxial state of stress – Elastic Constants - Stresses and deformation of thin cylindrical and spherical shells – Stresses at a point – Stress tensor - Stresses on inclined planes – Principal stresses and principal planes – Mohr’s circle of stress.

UNIT II ANALYSIS OF PLANE TRUSSES 9

Stability and equilibrium of plane frames – perfect frames - types of trusses – Analysis of forces in truss members – Method of joints – Method of tension coefficient – Method of sections.

UNIT III BENDING OF BEAMS 9

Beams – types and transverse loading on beams – shear force and bending moment in beams – Cantilever beams – Simply supported beams and over-hanging beams - Theory of simple bending – bending stress distribution – Load carrying capacity – Proportioning of sections – Leaf springs – Flitched beams – Shear stress distribution.

UNIT IV TORSION 9

Theory of simple torsion - Stresses and deformation in circular and hollow shafts – Stepped shafts – Shafts fixed at both ends – Stresses and deflection in helical springs.

UNIT V DEFLECTION OF BEAMS 9

Double Integration method – Macaulay’s method – Area moment method – Conjugate beam method for computation of slopes and deflections in determinate beams.

TOTAL: 45 PERIODS**TEXT BOOKS:**

1. Egor. P.Popov “ Engineering Mechanics of Solids” Prentice Hall of India, New Delhi, 2001
2. Vazirani, N, Ratwani, M. “Analysis of Structures” Khanna Publishers, New Delhi, 2001
3. Rajput, R.K “Strength of Materials”, S Chand & Company Ltd., New Delhi, 2006

REFERENCES

1. Irwing H.Shames, James M.Pitarresi, “Introduction to Solid Mechanics”, Prentice Hall of India, New Delhi, 2002
2. Roger T.Fenner, “ Mechanics of Solids”, ELBS, Oseny Mead, Oxford, 1990
3. Malhotra, D.R. Gupta, H.C., “The Strength of Materials”, Satya Prakashan (Tech. India Publications), New Delhi, 1995.
4. Beer.F.P. & Johnston.E.R.“Mechanics of Materials”, Tata McGraw Hill, New Delhi 2004.
5. Elangovan.A., “Thinmavisaiyiyal” (Mechanics of Solids in Tamil), Anna University,1995.

AIM:

To facilitate the understanding of the principles and to cultivate the art of formulating physical problems in the language of mathematics.

OBJECTIVES:

- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems
- To acquaint the student with Fourier transform techniques used in wide variety of situations in which the functions used are not periodic
- To introduce the effective mathematical tools for the solutions of partial differential equations that model physical processes
- To develop Z- transform techniques which will perform the same task for discrete time systems as Laplace Transform, a valuable aid in analysis of continuous time systems

UNIT – I FOURIER SERIES**9**

Dirichlet's conditions – General Fourier series – Odd and even functions – Half-range Sine and Cosine series – Complex form of Fourier series – Parseval's identity – Harmonic Analysis.

UNIT – II FOURIER TRANSFORM**9**

Fourier integral theorem – Fourier transform pair-Sine and Cosine transforms – Properties – Transform of elementary functions – Convolution theorem – Parseval's identity.

UNIT – III PARTIAL DIFFERENTIAL EQUATIONS**9**

Formation – Solutions of first order equations – Standard types and Equations reducible to standard types – Singular solutions – Lagrange's Linear equation – Integral surface passing through a given curve – Solution of linear equations of higher order with constant coefficients.

UNIT – IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS**9**

Method of separation of Variables – Solutions of one dimensional wave equation and one-dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions in Cartesian coordinates.

UNIT – V Z – TRANSFORM AND DIFFERENCE EQUATIONS**9**

Z-transform – Elementary properties – Inverse Z-transform – Convolution theorem – Initial and Final value theorems – Formation of difference equation – Solution of difference equation using Z-transform.

TOTAL: 45 PERIODS**TEXT BOOKS**

1. Grewal, B.S. "Higher Engineering Mathematics", Khanna Publications (2007)

REFERENCES

1. Glyn James, "Advanced Modern Engineering Mathematics, Pearson Education (2007)
2. Ramana, B.V. "Higher Engineering Mathematics" Tata McGraw Hill (2007).
3. Bali, N.P. and Manish Goyal, "A Text Book of Engineering 7th Edition (2007) Lakshmi Publications (P) Limited, New Delhi.

OBJECTIVE:

- To learn the computation of deflection of beams and trusses using energy principles, analysis of indeterminate beams and columns, state of stress in three dimensions.

UNIT I ENERGY PRINCIPLES 10

Strain energy and strain energy density – Strain energy in axial force - shear, flexure and torsion – Castigliano's and Engesser's theorems – Principle of virtual work – Application of energy theorems for computing deflections in beams, pin jointed frames – Maxwell's reciprocal theorem.

UNIT II INDETERMINATE BEAMS 9

Propped Cantilever and Fixed Beams – Fixed end moments reactions, slope and deflection for standard cases of loading — Continuous beams – support reactions and moments – Theorem of three moments – Shear Force and Bending Moment Diagrams

UNIT III COLUMNS 8

Behaviour of short and long columns. Euler's theory of long columns – Critical loads for prismatic columns with different end conditions - Rankine-Gordon Formula - Eccentrically loaded long columns -Eccentrically loaded short columns - middle third rule – core of section.

UNIT IV STATE OF STRESS IN THREE DIMENSIONS 8

Determination of principal stresses and principal planes – volumetric strain – Theories of failure – Principal stress, principal strain, shear stress, strain energy and distortion energy theories – Application in analysis of stress, load carrying capacity and design of members. Interaction problems - interaction curves.

UNIT V ADVANCED TOPICS 10

Unsymmetrical bending of beams - symmetrical and unsymmetrical sections, shear centre – stresses on curved beams for simple solid sections – Winkler Bach Formula – Thick cylinders – Compound cylinders - Residual stresses – Stress concentration – Fatigue and fracture.

TOTAL: 45 PERIODS**TEXT BOOKS:**

- Irwing H.Shames, James M.Pitarresi, "Introduction to Solid Mechanics, Prentice Hall of India, New Delhi, 2002.
- Rajput.R K - Strength Of Materials - S.Chand & Co, New Delhi, 1996
- Srinath, L.S. "Advanced Mechanics of Solids", Tata McGraw Hill Publishing Company Ltd. New Delhi 2004
- Bedi, D.S., "Strength of Materials", Khanna Book Publishing Co. (P) Ltd. Delhi, 2000

REFERENCES:

- Malhotra, D.R. Gupta, H.C., "The Strength of Materials", Satya Prakashan, Tech. India Publications, New Delhi, 1995.
- William A.Nash, Theory and Problems of Strength of Materials, Schaum's Outline Series, McGraw Hill International Editions, Third Edition, 1994.
- Punmia, B.C, Ashok Kumar Jain,, Arun Kumar Jain " Strength of Materials and Theory of Structures" Volume I and II, Lakshmi publications, New Delhi, 1998
- Andrew Pytel Ferdinard L.Singer, "Strength of Materials", International Student Edition (ISE Reprint), Harper Collins College Division, 1999.
- Timoshenko, S.P. & Young D.H., "Elements of Strength of Materials, V Edition, affiliated East-West Press Pvt. Ltd. New Delhi, 1998.

OBJECTIVE:

- The objective of this course is to equip the students with advanced methods of surveying and to introduce elements of photogrammetry, electromagnetic distance measurement, cartography, hydrographic surveying and cadastral surveying.

UNIT I TACHEOMETRIC SURVEYING 6

Tacheometric systems - Tangential, stadia and subtense methods - Stadia systems - Horizontal and inclined sights - Vertical and normal staffing - Fixed and movable hairs - Stadia constants - Anallactic lens - Subtense bar.

UNIT II CONTROL SURVEYING 8

Working from whole to part - Horizontal and vertical control methods - Triangulation - Signals - Base line - Instruments and accessories - Corrections - Satellite station - Reduction to centre - Trigonometrical levelling - Single and reciprocal observations - Modern trends.

UNIT III SURVEY ADJUSTMENTS 8

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 - Level nets - Adjustment of simple triangulation networks.

UNIT IV ASTRONOMICAL SURVEYING 11

Celestial sphere - Astronomical terms and definitions - Motion of sun and stars - Apparent altitude and corrections - Celestial co-ordinate systems - Different time systems - Nautical almanac - Star constellations - Practical astronomy - Field observations and calculations for azimuth.

UNIT V HYDROGRAPHIC AND ADVANCE SURVEYING 12

Hydrographic Surveying - Tides - MSL - Sounding methods - Location of soundings and methods - Three point problem - Strength of fix - Sextants and station pointer - River surveys - Measurement of current and discharge - Photogrammetry - Introduction - Basic concepts of Terrestrial and aerial Photographs - Stereoscapy - Definition of Parallax. Electromagnetic distance measurement - Basic principles - Instruments - Trilateration. Basic concepts of Cartography and Cadastral surveying.

TOTAL: 45 PERIODS**TEXTBOOKS:**

- Bannister A. and Raymond S., Surveying, ELBS, Sixth Edition, 1992.
- Heribert Kahmen and Wolfgang Faig, Surveying, Walter de Gruyter, 1995.
- Kanetkar T.P., Surveying and Levelling, Vols. I and II, United Book Corporation, Pune, 1994.
- Punmia B.C., Surveying, Vols. I, II and III, Laxmi Publications, 1989.

REFERENCES:

- Clark D., Plane and Geodetic Surveying, Vols. I and II, C.B.S. Publishers and Distributors, Delhi, Sixth Edition, 1971.
- James M. Anderson and Edward M. Mikhail, Introduction to Surveying, McGraw Hill Book Company, 1985.
- Wolf P.R., Elements of Photogrammetry, McGraw Hill Book Company, Second Edition, 1986.
- 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.
- Schofield, W., Engineering Surveying, Butterworth -Heinemann, London, 5th Edition, 2001

OBJECTIVE:

- The objective of this course is to train the students to acquire skill in making precise measurements and obtaining accurate results.

LIST OF EXPERIMENTS

1. Setting out works - Foundation marking - Simple curve (right/left-handed) – Transition curve.
2. Theodolite Traversing
3. Heights and Distances – Triangulation problem – Single plane method
4. Tacheometry - Tangential system - Stadia system - Subtense system
5. Field observation on SUN to calculate azimuth.
6. Experiments on Total Station – GPS.
7. Study of Micro Optic Theodolite - Digital Theodolite.

TOTAL: 60 PERIODS**OBJECTIVE**

The members of a structure are subjected to internal forces like axial forces, shearing forces, bending and torsional moments while transferring the loads acting on it. Structural analysis deals with analysing these internal forces in the members of the structures. At the end of this course students will be conversant with classical method of analysis.

UNIT I DEFLECTION OF DETERMINATE STRUCTURES 12

Principles of virtual work for deflections – Deflections of pin-jointed plane frames and rigid plane frames – Willot diagram - Mohr's correction

**UNIT II MOVING LOADS AND INFLUENCE LINES 12
(DETERMINATE & INDETERMINATE STRUCTURES WITH REDUNDANCY RESTRICTED TO ONE)**

Influence lines for reactions in statically determinate structures – influence lines for members forces in pin-jointed frames – Influence lines for shear force and bending moment in beam sections – Calculation of critical stress resultants due to concentrated and distributed moving loads. Muller Breslau's principle – Influence lines for continuous beams and single storey rigid frames – Indirect model analysis for influence lines of indeterminate structures – Beggs deformeter

UNIT III ARCHES 12

Arches as structural forms – Examples of arch structures – Types of arches – Analysis of three hinged, two hinged and fixed arches, parabolic and circular arches – Settlement and temperature effects.

UNIT IV SLOPE DEFLECTION METHOD 12

Continuous beams and rigid frames (with and without sway) – Symmetry and antisymmetry – Simplification for hinged end – Support displacements

UNIT II ENVIRONMENTAL POLLUTION 8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", 2nd edition, Pearson Education, 2004.
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.

REFERENCES:

1. R.K.Trivedi, "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, "Environmental law", Prentice hall of India PVT LTD, New Delhi, 2007.
4. Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 2005.

OBJECTIVE

After undergoing this course, the student gains adequate knowledge on engineering properties of soil.

UNIT I INTRODUCTION 10

Nature of Soil - Problems with soil - phase relation - sieve analysis - sedimentation analysis – Atterberg limits - classification for engineering purposes - BIS Classification system - Soil compaction - factors affecting compaction – field compaction methods and monitoring.

UNIT II SOIL WATER AND WATER FLOW 8

Soil water – Various forms – Influence of clay minerals – Capillary rise – Suction - Effective stress concepts in soil – Total, neutral and effective stress distribution in soil - Permeability – Darcy’s Law- Permeability measurement in the laboratory – quick sand condition - Seepage – Laplace Equation - Introduction to flow nets –properties and uses - Application to simple problems.

UNIT III STRESS DISTRIBUTION, COMPRESSIBILITY AND SETTLEMENT 10

Stress distribution in soil media – Boussinesque formula – stress due to line load and Circular and rectangular loaded area - approximate methods - Use of influence charts – Westergaard equation for point load - Components of settlement - Immediate and consolidation settlement - Terzaghi's one dimensional consolidation theory – governing differential equation - laboratory consolidation test – Field consolidation curve – NC and OC clays - problems on final and time rate of consolidation

UNIT IV SHEAR STRENGTH 9

Shear strength of cohesive and cohesionless soils - Mohr - Coulomb failure theory – Saturated soil - Strength parameters - Measurement of shear strength, direct shear, Triaxial compression, UCC and Vane shear tests –Types of shear tests based on drainage and their applicability - Drained and undrained behaviour of clay and sand – Stress path for conventional triaxial test.

UNIT V SLOPE STABILITY 8

Slope failure mechanisms - Modes - Infinite slopes - Finite slopes – Total and effective stress analysis - Stability analysis for purely cohesive and C- ϕ soils - Method of slices – Modified Bishop’s method - Friction circle method - stability number – problems – Slope protection measures.

TOTAL: 45 PERIODS**TEXT BOOKS:**

1. Punmia P.C., “Soil Mechanics and Foundations”, Laximi Publications Pvt. Ltd., New Delhi, 1995.
2. Gopal Ranjan and Rao A.S.R., “Basic and applied soil mechanics”, New Age International Publishers, New Delhi, 2000.
3. Venkatramaiah, C. “Geotechnical Engineering”, New Age International Publishers, New Delhi, 1995
4. Khan I.H., “A text book of Geotechnical Engineering”, Prentice Hall of India, New Delhi, 1999.

REFERENCES:

1. Coduto, D.P., "Geotechnical Engineering Principles and Practices", Prentice Hall of India Private Limited, New Delhi, 2002.
2. McCarthy D.F., "Essentials of Soil Mechanics and Foundations Basic Geotechniques", Sixth Edition, Prentice-Hall, New Jersey, 2002.
3. Das, B.M, "Principles of Geotechnical Engineering", (fifth edition), Thomas Books/cole, 2002
4. Muni Budhu, "Soil Mechanics and Foundations", John Willey & Sons, Inc, New York, 2000.

PTCE 2255**HIGHWAY ENGINEERING****L T P C
3 0 0 3****OBJECTIVE**

The objective of the course is to educate the students on the various components of Highway Engineering. It exposes the students to highway planning, engineering surveys for highway alignment, Design of Geometric Elements of Highways and Urban roads, Rigid and Flexible pavements design. The students further learn the desirable properties of highway materials and various practices adopted for construction. This course enables the students to develop skill on evaluation of the pavements and to decide appropriate types of maintenance.

UNIT I HIGHWAY PLANNING AND ALIGNMENT**9**

History of Road Construction, Highway Development in India - Jayakar Committee Recommendations and Realisations, Twenty-year Road Development Plans, Concepts of On-going Highway Development Programmes at National Level, Institutions for Highway Development at National level - Indian Roads Congress, Highway Research Board, National Highway Authority of India, Ministry of Road Transport and Highways (MORTH) and Central Road Research Institute. 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 - Principles of Highway Financing

UNIT II GEOMETRIC DESIGN OF HIGHWAYS**9**

Design of Horizontal Alignment – Horizontal Curves Super elevation, Widening of Pavements on Horizontal Curves and Transition Curves Design of Vertical Alignments – Rolling, Limiting, Exceptional and Minimum Gradients, Summit and Valley Curves-Sight Distances - Factors affecting Sight Distances, PIEV theory, 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 FLEXIBLE AND RIGID PAVEMENTS**9**

Rigid and Flexible Pavements- Components and their Functions -Design Principles of Flexible and Rigid Pavements, Factors affecting the Design of Pavements - ESWL, Climate, Sub-grade Soil and Traffic - Design Practice for Flexible Pavements [IRC Method and Recommendations- Problems] - Design Practice for Rigid Pavements – IRC Recommendations - concepts only.

UNIT IV HIGHWAY MATERIALS AND CONSTRUCTION PRACTICE 9

Desirable Properties and Testing of Highway Materials: Soil – California Bearing Ratio Test, Field Density Test - Aggregate - Crushing, Abrasion, Impact Tests, Water absorption, Flakiness and Elongation indices and Stone polishing value test - 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]

UNIT V HIGHWAY MAINTENANCE 9

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. - Pavement Evaluation – Pavement Surface Conditions and Structural Evaluation, Evaluation of pavement Failure and strengthening - Overlay design by Benkelman Beam Method [Procedure only],

TOTAL: 45 PERIODS**TEXT BOOKS:**

1. Khanna K and Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2001.
2. Kadiyali L R, Principles and Practice of Highway Engineering, Khanna Technical Publications, Delhi, 2000.

REFERENCES

1. Transportation Engineering & Planning, C.S. Papacostas, P.D. Prevedouros, Prentice Hall of India Pvt Ltd, 2006.
2. IRC Standards (IRC 37 - 2001 & IRC 58 -1998)
3. Bureau of Indian Standards (BIS) Publications on Highway Materials
4. Specifications for Road and Bridges, MORTH (India)

PTCE 2208	COMPUTER AIDED BUILDING DRAWING	L T P C
	(PRACTICAL)	0 0 4 2

OBJECTIVE:

At the end of this course the student should be able to draft on computer building drawings (Plan, elevation and sectional views) in accordance with development and control rules satisfying orientation and functional requirements for the following:

- | | |
|---|----|
| 1. Buildings with load bearing walls (Flat and pitched roof) – Including details of doors and windows | 15 |
| 2. RCC framed structures | 15 |
| 3. Industrial buildings – North light roof structures – Trusses | 15 |
| 4. Perspective view of one and two storey buildings | 15 |

TOTAL: 60 PERIODS**TEXT BOOKS:**

1. Civil Engg. Drawing & House Planning – Varma B.P., Khanna publishers, Delhi
2. Building drawing & detailing – Balagopal & T.S. Prabhu, Spades Publishers, Calicut.

REFERENCES:

1. Building drawing – Shah.M.G., Tata McGraw-Hill,1992
2. Building planning & Drawing –Kumaraswamy N., Kameswara Rao A., Charotar Publishing
3. Shah, Kale and Patki, Building Drawing with integrated approach to built environment, Tata McGraw-Hill.

Examination Guideline

30% of the end semester examination paper shall deal with planning, while the rest 70% shall be based on the drafting skill.

LIST OF EQUIPMENTS
(For a batch of 30 students)

Sl. No.	Description of Equipments	Quantity
1.	Computer system of Pentium IV or equivalent	1 for each student
2.	Licensed version of any reputed Analysis, Design & Drafting software	1 copy for a set of 3 students

PTCE 2352**DESIGN OF STEEL STRUCTURES**

L T P C
3 0 0 3

OBJECTIVE:

This course covers the design of structural steel members subjected to compressive, tensile and bending loads, as per current codal provisions (IS 800 - 2007) including connections. Design of structural systems such as roof trusses, gantry girders are included.

UNIT I INTRODUCTION 12

Properties of steel – Structural steel sections – Limit State Design Concepts – Loads on Structures – Metal joining methods using rivets, welding, bolting – Design of bolted, riveted and welded joints – Eccentric connections - Efficiency of joints – High Tension bolts

UNIT II TENSION MEMBERS 8

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 III COMPRESSION MEMBERS 6

Types of compression members – Theory of columns – Basis of current codal provision for compression member design – Slenderness ratio – Design of single section and compound section compression members – Design of lacing and battening type columns – Design of column bases – Gusseted base

UNIT IV BEAMS 12

Design of laterally supported and unsupported beams – Built up beams – Beams subjected to biaxial bending – Design of plate girders riveted and welded – Intermediate and bearing stiffeners – Web splices – Design of beam columns

UNIT V ROOF TRUSSES AND INDUSTRIAL STRUCTURES 12

Roof trusses – Roof and side coverings – Design loads, design of purlin and elements of truss; end bearing – Design of gantry girder

TUTORIAL: 15 TOTAL: 60 PERIODS

TEXT BOOKS:

1. Dayaratnam, P., “Design of Steel Structures”, Second edition, S. Chand & Company, 2003.
2. Ramachandra, S. and Virendra Gehlot, “Design of Steel Structures – Vol. I & II”, Standard Publication, New Delhi, 2007

REFERENCES:

1. “Teaching Resources for Structural Steel Design – Vol. I & II”, INSDAG, Kolkatta.
2. Gaylord, E.H., Gaylord, N.C., and Stallmeyer, J.E., “Design of Steel Structures”, 3rd edition, McGraw-Hill Publications, 1992
3. Negi L.S.. Design of Steel Structures, Tata McGraw Hill Publishing Pvt Ltd, New Delhi, 2007.
4. IS 800-2007 Indian Standard General Construction in Steel – code of practice (3rd Revision).

**PTCE2353 CONSTRUCTION PLANNING & SCHEDULING L T P C
3 0 0 3**

OBJECTIVE

At the end of this course the student is expected to have learnt how to plan construction projects, schedule the activities using network diagrams, determine the cost of the project, control the cost of the project by creating cash flows and budgeting and how to use the project information as an information and decision making tool.

UNIT I CONSTRUCTION PLANNING 6

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 12

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 precedences -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 11

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 8

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 8

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 PERIODS

TEXT BOOKS:

1. Chitkara, K.K. "Construction Project Management Planning", Scheduling and Control, Tata McGraw-Hill Publishing Co., New Delhi, 1998.
2. Srinath,L.S., "Pert and CPM Priniples and Applications ", Affiliated East West Press, 2001

REFERENCES:

1. Chris Hendrickson and Tung Au, "Project Management for Construction Fundamentals Concepts for Owners", Engineers, Architects and Builders, Prentice Hall, Pittsburgh, 2000.
2. Moder.J., C.Phillips and Davis, "Project Management with CPM", PERT and Precedence Diagramming, Van Nostrand Reinhold Co., Third Edition, 1983.
3. Willis., E.M., "Scheduling Construction projects", John Wiley and Sons 1986.
4. Halpin,D.W., "Financial and cost concepts for construction Management", John Wiley and Sons, New York, 1985.

PTCE 2351

STRUCTURAL ANALYSIS-II

L T P C

3 0 0 3

OBJECTIVE

This course is in continuation of Structural Analysis – Classical Methods. Here in advanced method of analysis like Matrix method and Plastic Analysis are covered. Advanced topics such as FE method and Space Structures are covered.

UNIT I FLEXIBILITY METHOD 12

Equilibrium and compatibility – Determinate vs Indeterminate structures – Indeterminacy - Primary structure – Compatibility conditions – Analysis of indeterminate pin-jointed plane frames, continuous beams, rigid jointed plane frames (with redundancy restricted to two).

UNIT II STIFFNESS MATRIX METHOD 12

Element and global stiffness matrices – Analysis of continuous beams – Co-ordinate transformations – Rotation matrix – Transformations of stiffness matrices, load vectors and displacements vectors – Analysis of pin-jointed plane frames and rigid frames(with redundancy vertical to two)

UNIT III FINITE ELEMENT METHOD 12

Introduction – Discretisation of a structure – Displacement functions – Truss element – Beam element – Plane stress and plane strain - Triangular elements

UNIT IV PLASTIC ANALYSIS OF STRUCTURES 12
Statically indeterminate axial problems – Beams in pure bending – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems

UNIT V SPACE AND CABLE STRUCTURES 12
Analysis of Space trusses using method of tension coefficients – Beams curved in plan Suspension cables – suspension bridges with two and three hinged stiffening girders

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Vaidyanathan, R. and Perumal, P., "Comprehensive structural Analysis – Vol. I & II", Laxmi Publications, New Delhi, 2003
2. L.S. Negi & R.S. Jangid, "Structural Analysis", Tata McGraw-Hill Publications, New Delhi, 2003.
3. BhaviKatti, S.S, "Structural Analysis – Vol. 1 Vol. 2", Vikas Publishing House Pvt. Ltd., New Delhi, 2008

REFERENCES:

1. Ghali.A, Nebille,A.M. and Brown,T.G. "Structural Analysis" A unified classical and Matrix approach" –5th edition. Spon Press, London and New York, 2003.
2. Coates R.C, Coutie M.G. and Kong F.K., "Structural Analysis", ELBS and Nelson, 1990
3. Structural Analysis – A Matrix Approach – G.S. Pandit & S.P. Gupta, Tata McGraw Hill 2004.
4. Matrix Analysis of Framed Structures – Jr. William Weaver & James M. Gere, CBS Publishers and Distributors, Delhi.

PTCE 2253 APPLIED HYDRAULICS ENGINEERING L T P C
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+3
Open channel flow – Types and regimes of flow – Velocity distribution in open channel – Wide open channel – Specific energy – Critical flow and its computation – channel transition.

UNIT II UNIFORM FLOW 8+3
Uniform flow – Velocity measurement – Manning's and Chezy's formula – Determination of roughness coefficients – Determination of normal depth and velocity – Most economical sections – Non-erodible channels

UNIT III VARIED FLOW 9+3

Dynamic equations of gradually varied flow – Assumptions – Characteristics of flow profiles – Draw down and back water curves – Profile determination – Graphical integration, direct step and standard step method – Flow through transitions - Hydraulic jump – Types – Energy dissipation – Surges.

UNIT IV PUMPS 9+3

Centrifugal pump - minimum speed to start the pump – multistage Pumps – Jet and submersible pumps - Positive displacement pumps - reciprocating pump - negative slip - flow separation conditions - air vessels -indicator diagram and its variation - savings in work done - rotary pumps.

UNIT V TURBINES 10+3

Turbines - draft tube and cavitations – Application of momentum principle – Impact of jets on plane and curved plates - turbines - classification - radial flow turbines - axial flow turbines – Impulse and Reaction

TOTAL (L: 45+T:15): 60 PERIODS

TEXT BOOKS

1. Subramanya K., "Flow in Open channels", Tata McGraw-Hill Publishing Company, 1994.
2. Modi, P.N, and Seth S.M. Hydraulic and Fluid Mechanics Standard Book House, 2000.
3. Bansal R.K, Fluid mechanics & Hydraulic machines, Laxmi Publishing Pvt Ltd, New Delhi - 2007

REFERENCES

1. Jain A.K., "Fluid Mechanics (including Hydraulic Machines)", Khanna Publishers, 8th edition, 1995.
2. Ranga Raju, K.G., "Flow through Open Channels", Tata McGraw-Hill, 1985

**PTCE2303 RAILWAYS, AIRPORTS AND HARBOUR ENGINEERING L T P C
3 0 0 3**

OBJECTIVE

This course imparts the student's knowledge of planning, design, construction and maintenance of railway tracks. The students acquire proficiency in the application of modern techniques such as GIS, GPS and remote sensing in Railway Engineering. The student develops skills on airport planning and design with the prime focus on runway and taxiway geometrics. Students become conversant with the definition, purpose, location and materials of coastal structures such as piers, breakwaters, wharves, jetties, quays and spring fenders. The students acquire knowledge on site reconnaissance for location and planning of harbours.

UNIT I RAILWAY PLANNING AND DESIGN 9

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

UNIT II RAILWAY TRACK CONSTRUCTION, MAINTENANCE AND OPERATION 9

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

UNIT III AIRPORT PLANNING AND DESIGN 9

Role 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 - 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

UNIT IV AIRPORT LAYOUTS, VISUAL AIDS, AND AIR TRAFFIC CONTROL 9

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 - 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 V 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, Soundings, Anchoring Grounds, Geological Characteristics, Winds & Storms, Position and Size of Shoals - Shore Considerations- Proximity to Towns/Cities, Utilities, Construction Materials, Coast Lines - Dry and Wet Docks, Planning and Layouts - Entrance, Position of Light Houses, Navigating - Terminal Facilities – Port Buildings, Warehouse, Transit Sheds, Inter-modal Transfer Facilities, Mooring Accessories, Navigational Aids - Coastal Structures- Piers, Breakwaters, Wharves, Jetties, Quays, Spring Fenders - Coastal Shipping, Inland Water Transport and Container Transportation.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Saxena Subhash C and Satyapal Arora, A Course in Railway Engineering, Dhanpat Rai and Sons, Delhi, 1998.
2. Khanna S K, Arora M G and Jain S S, Airport Planning and Design, Nemchand and Brothers, Roorkee, 1994.
3. S P Bindra, A Course in Docks and Harbour Engineering, Dhanpat Rai and Sons, New Delhi, 1993.

REFERENCES:

1. Rangwala, Railway Engineering, Charotar Publishing House, 1995.
2. Rangwala, Airport Engineering, Charotar Publishing House, 1996.
3. Oza.H.P. and Oza.G.H., “A course in Docks & Harbour Engineering”. Charotar Publishing Co.1976.
4. J.S. Mundrey, “A course in Railway Track Engineering”. Tata McGraw Hill, 2000.

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 ESTIMATE OF BUILDINGS 11

Load bearing and framed structures – 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 II ESTIMATE OF OTHER STRUCTURES 10

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, fall.

UNIT III SPECIFICATION AND TENDERS 8

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

UNIT IV VALUATION 8

Necessity – Basics of value engineering – Capitalised value – Depreciation – Escalation – Value of building – Calculation of Standard rent – Mortgage – Lease

UNIT V REPORT PREPARATION 8

Principles for report preparation – report on estimate of residential building – Culvert – Roads – Water supply and sanitary installations – Tube wells – Open wells.

TOTAL: 45 PERIODS**TEXT BOOKS**

1. Dutta, B.N., "Estimating and Costing in Civil Engineering", UBS Publishers & Distributors Pvt. Ltd., 2003
2. Kohli, D.D and Kohli, R.C., "A Text Book of Estimating and Costing (Civil)", S.Chand & Company Ltd., 2004

REFERENCES

1. PWD Data Book.

OBJECTIVE:

The main 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 rudiments of theory of vibrations necessary to understand and analyse the dynamic forces caused by earthquakes and structures. Further, the student is also taught the codal provisions as well as the aseismic design methodology.

UNIT I THEORY OF VIBRATIONS 9

Concept of inertia and damping – Types of Damping – Difference between static forces and dynamic excitation – 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 PERIODS**TEXT BOOKS:**

1. Chopra, A.K., "Dynamics of Structures – Theory and Applications to Earthquake Engineering", Second Edition, Pearson Education, 2003.

REFERENCES:

1. Biggs, J.M., "Introduction to Structural Dynamics", McGraw–Hill Book Co., N.Y., 1964
2. Dowrick, D.J., "Earthquake Resistant Design", John Wiley & Sons, London, 1977
3. Paz, M., "Structural Dynamics – Theory & Computation", CSB Publishers & Distributors, Shahdara, Delhi, 1985
5. NPEEE Publications.

OBJECTIVE:

- To impart knowledge on common method of sub soil investigation and design of foundations. At the end of this course student acquires the capacity to investigate the soil condition and to select and design a suitable foundation.

UNIT I SITE INVESTIGATION AND SELECTION OF FOUNDATION 9

Scope and objectives – Methods of exploration – auguring and boring – Wash boring and rotary drilling – Depth of boring – Spacing of bore hole – Sampling techniques – Representative and undisturbed sampling methods - Split spoon sampler, Thin wall sampler, Stationery piston sampler – Bore log report – Samples Penetration Tests (SPT and SCPT) – Data interpretation - strength parameters and liquefaction potential - Selection of foundation based on soil conditions.

UNIT II SHALLOW FOUNDATION 9

Introduction – Location and depth of foundation – Codal provisions – bearing capacity of shallow foundation on homogeneous deposits – Terzaghi's formula and BIS formula – factors affecting bearing capacity – problems – Bearing capacity from in-situ tests (SPT, SCPT and plate load) – Allowable bearing pressure – Seismic considerations in bearing capacity evaluation. Determination of Settlement of foundations on granular and clay deposits – Total and differential settlement – Allowable settlements – Codal provision – Methods of minimizing total and differential settlements.

UNIT III FOOTINGS AND RAFTS 9

Types of foundation – Contact pressure distribution below footings and raft: Isolated footing – Combined footings – Types and proportioning – Mat foundation – Types – Applications – Proportioning – Floating foundation – Seismic force consideration – Codal Provision.

UNIT IV PILE 9

Types of piles and their function – Factors influencing the selection of pile – Carrying capacity of single pile in granular and cohesive soil – static formula – dynamic formulae (Engineering news and Hileys) – Capacity from insitu tests (SPT and SCPT) – Negative skin friction – uplift capacity- Group capacity by different methods (Feld's rule, Converse – Labarre formula and block failure criterion) – Settlement of pile groups – Interpretation of pile load test (routine test only) – Underreamed piles – Capacity under compression and uplift.

UNIT V RETAINING WALLS 9

Plastic equilibrium in soils – active and passive states – Rankine's theory – cohesionless and cohesive soil – Coulomb's wedge theory – Condition for critical failure plane – Earth pressure on retaining walls of simple configurations – Culmann Graphical method – pressure on the wall due to line load – Stability analysis of retaining walls.

TEXT BOOKS

- Murthy, V.N.S, "Soil Mechanics and Foundation Engineering", UBS Publishers Distribution Ltd, New Delhi, 1999.
- Gopal Ranjan and Rao, A.S.R. "Basic and Applied Soil Mechanics", Wiley Eastern Ltd., New Delhi (India), 2003.

REFERENCES

1. Das, B.M. "Principles of Foundation Engineering (Fifth edition), Thomson Books COLE, 2003
2. Bowles J.E, "Foundation analysis and design", McGraw-Hill, 1994
3. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi publications pvt. Ltd.,New Delhi, 1995.
4. Venkatramaiah,C."Geotechnical Engineering", New Age International Publishers, New Delhi, 1995

TOTAL: 45 PERIODS

**PTCE 2404 PRESTRESSED CONCRETE STRUCTURE L T P C
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 – THEORY AND BEHAVIOUR 9

Basic concepts – Advantages – Materials required – Systems and methods of prestressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons – Effect of tendon profile on deflections – Factors influencing deflections – Calculation of deflections – Short term and long term deflections - Losses of prestress – Estimation of crack width

UNIT II DESIGN CONCEPTS 9

Flexural strength – Simplified procedures as per codes – strain compatibility method – Basic concepts in selection of cross section for bending – stress distribution in end block, Design of anchorage zone reinforcement – Limit state design criteria – Partial prestressing – Applications.

UNIT III CIRCULAR PRESTRESSING 9

Design of prestressed concrete tanks – Pipes

UNIT IV COMPOSITE CONSTRUCTION 9

Analysis for stresses – Estimate for deflections – Flexural and shear strength of composite members

UNIT V PRE-STRESSED CONCRETE BRIDGES 9

General aspects – pretensioned prestressed bridge decks – Post tensioned prestressed bridge decks – Principles of design only.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Krishna Raju N., Prestressed concrete, Tata McGraw Hill Company, New Delhi 1998
2. Mallic S.K. and Gupta A.P., Prestressed concrete, Oxford and IBH publishing Co. Pvt. Ltd. 1997.
3. Rajagopalan, N, "Prestressed Concrete", Alpha Science, 2002

REFERENCES

1. Ramaswamy G.S., Modern prestressed concrete design, Arnold Heinimen, New Delhi, 1990
2. Lin T.Y. Design of prestressed concrete structures, Asia Publishing House, Bombay 1995.
3. David A.Sheppard, William R. and Philips, Plant Cast precast and prestressed concrete – A design guide, McGraw Hill, New Delhi 1992.

PTCE 2301

IRRIGATION ENGINEERING

L T P C
3 0 0 3

OBJECTIVE

At the end of the semester, the student shall understand the need and mode of irrigation. The student also shall know the irrigation management practices of the past, present and future. The structures involved the elementary hydraulic design of different structures and the concepts of maintenance shall also form part. Finally, the student shall be in a position to conceive and plan any type of irrigation project.

UNIT I INTRODUCTION 9

Irrigation – Need and mode of irrigation – Merits and demerits of irrigation – Crop and crop seasons – consumptive use of water – Duty – Factors affecting duty – Irrigation efficiencies – Planning and Development of irrigation projects.

UNIT II IRRIGATION METHODS 8

Canal irrigation – Lift irrigation – Tank irrigation – Flooding methods – Merits and demerits – Sprinkler irrigation – Drip irrigation

UNIT III DIVERSION AND IMPOUNDING STRUCTURES 10

Weirs – elementary profile of a weir – weirs on pervious foundations - Types of impounding structures - Percolation ponds – Tanks, Sluices and Weirs – Gravity dams – Earth dams – Arch dams – Spillways – Factors affecting location and type of dams – Forces on a dam – Hydraulic design of dams.

UNIT IV CANAL IRRIGATION 10

Alignment of canals – Classification of canals – Canal drops – Hydraulic design of drops – Cross drainage works – Hydraulic design of cross drainage works – Canal Head works – Canal regulators – River Training works.

UNIT V IRRIGATION WATER MANAGEMENT 8

Need for optimisation of water use – Minimising irrigation water losses – On farm development works - Participatory irrigation management – Water users associations – Changing paradigms in water management – Performance evaluation.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Asawa, G.L., "Irrigation Engineering", New Age International Publishers, 2000
2. Punima B.C. & Pande B.B .Lal Irrigation and Water Power Engineering, Laxmi Publishing, New Delhi 2007
3. Michael, A.M, Irrigation Theory and Practical, Vikas Publishing Pvt Ltd, 2006
4. Gupta, B.L, & Amir Gupta, "Irrigation Engineering", Satya Praheshan, New Delhi

REFERENCES:

1. Dilip Kumar Majumdar, "Irrigation Water Management (Principles & Practices)", Prentice Hall of India (P), Ltd, 2000
2. Basak, N.N, "Irrigation Engineering", Tata McGraw-Hill Publishing Co. New Delhi, 1999
3. Sharma R.K.. "Irrigation Engineering", S.Chand & Co. 2007.

PTMG2351**PRINCIPLES OF MANAGEMENT
(Common to all Branches)****L T P C
3 0 0 3****OBJECTIVE**

Knowledge on the principles of management is essential for all kinds of people in all kinds of organizations. After studying this course, students will be able to have a clear understanding of the managerial functions like planning, organizing, staffing, leading and controlling. Students will also gain some basic knowledge on international aspect of management.

UNIT I OVERVIEW OF MANAGEMENT 9

Organization - Management - Role of managers - Evolution of Management thought - Organization and the environmental factors - Managing globally - Strategies for International Business.

UNIT II PLANNING 9

Nature and purpose of planning - Planning process - Types of plans – Objectives - - Managing by objective (MBO) Strategies - Types of strategies - Policies - Decision Making - Types of decision - Decision Making Process - Rational Decision Making Process - Decision Making under different conditions.

UNIT III ORGANIZING 9

Nature and purpose of organizing - Organization structure - Formal and informal groups / organization - Line and Staff authority - Departmentation - Span of control - Centralization and Decentralization - Delegation of authority - Staffing - Selection and Recruitment - Orientation - Career Development - Career stages – Training - - Performance Appraisal.

UNIT IV DIRECTING 9

Creativity and Innovation - Motivation and Satisfaction - Motivation Theories - Leadership - Leadership theories - Communication - Hurdles to effective communication - Organization Culture - Elements and types of culture - Managing cultural diversity.

UNIT V CONTROLLING 9

Process of controlling - Types of control - Budgetary and non-budgetary control techniques - Managing Productivity - Cost Control - Purchase Control - Maintenance Control - Quality Control - Planning operations.

TOTAL : 45 PERIODS**TEXT BOOKS:**

1. Stephen P. Robbins and Mary Coulter, 'Management', Prentice Hall of India, 8th edition.
2. Charles W L Hill, Steven L McShane, 'Principles of Management', Mcgraw Hill Education, Special Indian Edition, 2007.

REFERENCES:

1. Hellriegel, Slocum & Jackson, ' Management - A Competency Based Approach', Thomson South Western, 10th edition, 2007.
2. Harold Koontz, Heinz Wehrich and Mark V Cannice, 'Management – A global & Entrepreneurial Perspective', Tata Mcgraw Hill, 12th edition, 2007.
3. Andrew J. Dubrin, 'Essentials of Management', Thomson Southwestern, 7th edition, 2007.

PTCE 2451 ENGINEERING ECONOMICS AND COST ANALYSIS L T P C
3 0 0 3

OBJECTIVES:

The main objective of this course is to make the Civil Engineering student know about the basic law of economics, how to organise a business, the financial aspects related to business, different methods of appraisal of projects and pricing techniques. At the end of this course the student shall have the knowledge of how to start a construction business, how to get finances, how to account, how to price and bid and how to assess the health of a project.

UNIT I BASIC ECONOMICS 7

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.

UNIT II DEMAND AND SCHEDULE 8

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 - market price and normal price - perfect competition - monopoly - monopolistic competition.

UNIT III ORGANISATION 8

Forms of business - proprietorship - partnership - joint stock company - cooperative organisation - state enterprise - mixed economy - money and banking - banking - kinds - commercial banks - central banking functions - control of credit - monetary policy - credit instrument.

UNIT IV 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.

UNIT V COST AND BREAK EVEN ANALYSES 13

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 – marginal cost pricing – going rate pricing – bid pricing – pricing for a rate of return – appraising project profitability – internal rate

of return – pay back period – net present value – cost benefit analysis – feasibility reports – appraisal process – technical feasibility- economic feasibility – financial feasibility. Break even analysis - basic assumptions – break even chart – managerial uses of break even analysis.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Dewett K.K. & Varma J.D., Elementary Economic Theory, S Chand & Co., 2006
2. Sharma JC “Construction Management and Accounts” Satya Prakashan, New Delhi.

REFERENCES:

1. Barthwal R.R., Industrial Economics - An Introductory Text Book, New Age
2. Jhingan M.L., Micro Economic Theory, Konark
3. Samuelson P.A., Economics - An Introductory Analysis, McGraw-Hill
4. Adhikary M., Managerial Economics
5. Khan MY and Jain PK “Financial Management” McGraw-Hill Publishing Co., Ltd
6. Varshney RL and Maheshwary KL “ Managerial Economics” S Chand and Co

PTCE 2453

PROJECT WORK

L T P C

0 0 12 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.

SYLLABUS:

The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner.

PTCE 2021

HYDROLOGY

L T P C

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 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 – Baseflow separation – Unit hydrograph – Derivation of unit hydrograph – S curve hydrograph – Unit hydrograph of different deviations - 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 PERIODS

TEXT BOOKS:

- 1 . Subramanya, K., “Engineering Hydrology”, Tata McGraw-Hill Publishing Co., Ltd., 2000
2. Raghunath, H.M., “Hydrology”, Wiley Eastern Ltd., 2000

REFERENCES:

1. Chow, V.T. and Maidment, “Hydrology for Engineers”, McGraw-Hill Inc., Ltd., 2000
2. Singh, V.P., “Hydrology”, McGraw-Hill Inc., Ltd., 2000.

PTCE 2022	CARTOGRAPHY	L T P C
		3 0 0 3

OBJECTIVE

At the end of the course the student will possess knowledge about Cartographic Concepts.

UNIT I	INTRODUCTION	9
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Cartography today - Nature of Cartography - History of Cartography - Graticules - Cartometry.

UNIT II	EARTH	9
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Earth-Map Relations - Basic Geodesy - Map Projections, Scale, Reference and Coordinate system - Transformation - Basic Transformation - Affin Transformation.

UNIT III SOURCES OF DATA 9
Sources of data - Ground Survey and Positioning - Remote Sensing data collection - Census and sampling - data - Models for digital cartographic information, Map digitizing.

UNIT IV PERCEPTION AND DESIGN 9
Cartographic design - Color theory and models - Color and pattern creation and specification - Color and pattern - Typography and lettering the map - Map compilation.

UNIT V CARTOGRAPHY ABSTRACTION 9
Selection and Generalisation Principles - Symbolisation - Topographic and thematic maps - Map production and Reproduction - Map series.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. R.W. ANSON and F.J. ORMELING, Basic Cartography for students and Technicians. Vol. I, II and III, Elsevirr Applied Science Publishers 2nd Edition, 1994.
2. ARTHUR, H. ROBINSON Et al Elements of Cartography, Sixth Edition, John Wiley and Sons, 1995.
3. John Campbell, Introductory Cartography Second Edition, 1994. Wm.C. Brown Publishers.
4. M.J.Kraak and F.J. Ormeling, Cartography: Visualisation and spatial data. Prentice Hall – 1996.

PTCE 2023 ELECTRONIC SURVEYING LT P C
3 0 0 3

OBJECTIVE

At the end of the course the student will posses knowledge about Electronic surveying

UNIT I FUNDAMENTALS 7
Methods of measuring distance, historical development, basic principles of EDM, classifications, applications and comparison with conventional surveying.

UNIT II BASIC ELETRONICS 8
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 11
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, first velocity correction, computation of refractive index for microwaves, measurement of atmospheric parameters, mean refractive index, real time application of first velocity correction, second velocity correction and total atmospheric correction.

UNIT IV ELECTROMAGNETIC DISTANCE MEASURING SYSTEM 11

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, care and maintenance of EDM instruments, Modern Positioning Systems. EDM traversing, trilateration and base line measurement using EDM.

UNIT V FIELD STUDIES 8

Study of different EDM instruments and Total Station. EDM traversing, trilateration and base line measurement using EDM.

TOTAL: 45 PERIODS

REFERENCES:

1. Burnside, C.D. Electromagnetic distance measurement Crosby Lock wood staples, U.K. 1971.
2. Rueger, J.M. Electronic Distance Measurement, Springer-Verlag, Berlin, 1990.
3. Laurila, S.H. Electronic Surveying in Practice, John Wiley and Sons Inc, 1983.
4. Soastamoinen, J.J. Surveyor's guide to electro-magnetic Distance Measurement, Adam Hilger Ltd., 1967.

**PTCE2024 REMOTE SENSING TECHNIQUES AND GIS LT P C
3 0 0 3**

OBJECTIVE

To introduce the students to the basic concepts and principles of various components of remote sensing. To provide an exposure to GIS and its practical applications in civil engineering.

UNIT I EMR AND ITS INTERACTION WITH ATMOSPHERE & EARTH MATERIAL 9

Definition of remote sensing and its components – Electromagnetic spectrum – wavelength regions important to remote sensing – Wave theory, Particle theory, Stefan-Boltzman and Wein's Displacement Law – Atmospheric scattering, absorption – Atmospheric windows – spectral signature concepts – typical spectral reflective characteristics of water, vegetation and soil.

UNIT II PLATFORMS AND SENSORS 9

Types of platforms – orbit types, Sun-synchronous and Geosynchronous – Passive and Active sensors – resolution concept – Pay load description of important Earth Resources and Meteorological satellites – Airborne and spaceborne TIR and microwave sensors.

UNIT III IMAGE INTERPRETATION AND ANALYSIS 9

Types of Data Products – types of image interpretation – basic elements of image interpretation - visual interpretation keys – Digital Image Processing – Pre-processing – image enhancement techniques – multispectral image classification – Supervised and unsupervised.

UNIT IV GEOGRAPHIC INFORMATION SYSTEM 9
Introduction – Maps – Definitions – Map projections – types of map projections – map analysis – GIS definition – basic components of GIS – standard GIS softwares – Data type – Spatial and non-spatial (attribute) data – measurement scales – Data Base Management Systems (DBMS).

UNIT V DATA ENTRY, STORAGE AND ANALYSIS 9
Data models – vector and raster data – data compression – data input by digitization and scanning – attribute data analysis – integrated data analysis Modeling in GIS Highway alignment studies – Land Information System.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Lillesand, T.M., Kiefer, R.W. and J.W. Chipman. (2004). Remote Sensing and Image Interpretation. V Edn. John Willey and Sons (Asia) Pvt. Ltd., New Delhi. Pp:763.
2. Anji Reddy, M. (2001). Textbook of Remote Sensing and Geographical
3. Information System. Second edn. BS Publications, Hyderabad.

REFERENCES:

1. Lo. C.P. and A.K.W. Yeung (2002). Concepts and Techniques of Geographic Information Systems. Prentice-Hall of India Pvt. Ltd., New Delhi. Pp:492.
3. Peter A. Burrough, Rachael A. McDonnell (2000). Principles of GIS. Oxford University Press.
4. Ian Heywood (2000). An Introduction to GIS. Pearson Education Asia.

PTCE2025

ARCHITECTURE

**LT P C
3 0 0 3**

OBJECTIVE

To provide the basic knowledge on the principles of design of buildings relating to the environment and climate.

UNIT I ARCHITECTURAL DESIGN 8
Architectural Design – an analysis – integration of function and aesthetics – Introduction to basic elements and principles of design.

UNIT II SITE PLANNING 9
Surveys – Site analysis – Development Control – Layout regulations- Layout design concepts.

UNIT III BUILDING TYPES 12
Residential, institutional, commercial and Industrial – Application of anthropometry and space standards-Inter relationships of functions – Safety standards – Building rules and regulations – Integration of building services – Interior design

UNIT IV CLIMATE AND ENVIRONMENTAL RESPONSIVE DESIGN 8
Man and environment interaction- Factors that determine climate – Characteristics of climate types – Design for various climate types – Passive and active energy controls – Green building concept

UNIT V TOWN PLANNING 8
 Planning – Definition, concepts and processes- Urban planning standards and zoning regulations- Urban renewal – Conservation – Principles of Landscape design

TOTAL: 45 PERIODS

REFERENCES

1. Francis D.K. Ching, “Architecture: Form, Space and Order”, VNR, N.Y., 1999.
2. Givoni B., “Man Climate and Architecture”, Applied Science, Barking ESSEX, 1982
3. Edward D.Mills, “Planning and Architects Handbook”, Butterworth London, 1995.
4. Gallian B.Arthur and Simon Eisner, “The Urban Pattern – City Planning and Design”, Affiliated Press Pvt. Ltd., New Delhi, 1995.
5. Margaret Robert, “An Introduction to Town Planning Techniques”, HutchinsoLondon ,1990.

**PTGE2022 TOTAL QUALITY MANAGEMENT L T P C
 3 0 0 3**

UNIT I INTRODUCTION 9
 Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM – TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM.

UNIT II TQM PRINCIPLES 9
 Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – PDSA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I 9
 The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

UNIT IV TQM TOOLS & TECHNIQUES II 9
 Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Cost of Quality – Performance measures.

UNIT V QUALITY SYSTEMS 9
 Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing- QS 9000 – ISO 14000 – Concepts, Requirements and Benefits – Case studies of TQM implementation in manufacturing and service sectors including IT. .

TOTAL: 45 PERIODS

TEXT BOOK:

1. Dale H.Besterfiled, et at., “Total Quality Management”, Pearson Education Asia, 3rd Edition, Indian Reprint (2006).

REFERENCES:

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality" 6th Edition, South-Western (Thomson Learning), 2005.
2. Oakland, J.S., "TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, 3rd Edition, 2003.
3. Suganthi, L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
4. Janakiraman, B and Gopal, R.K, "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006

PTGE2023**FUNDAMENTALS OF NANOSCIENCE****L T P C
3 0 0 3****UNIT I INTRODUCTION 10**

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles-quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II PREPARATION METHODS 10

Bottom-up Synthesis-Top-down Approach: Precipitation, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMB.

UNIT III PATTERNING AND LITHOGRAPHY FOR NANOSCALE DEVICES 5

Introduction to optical/UV electron beam and X-ray Lithography systems and processes, Wet etching, dry (Plasma /reactive ion) etching, Etch resists-dip pen lithography

UNIT IV PREPARATION ENVIRONMENTS 10

Clean rooms: specifications and design, air and water purity, requirements for particular processes, Vibration free environments: Services and facilities required. Working practices, sample cleaning, Chemical purification, chemical and biological contamination, Safety issues, flammable and toxic hazards, biohazards.

UNIT V CHARACTERISATION TECHNIQUES 10

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation

TOTAL: 45 PERIODS**TEXT BOOKS:**

1. A.S. Edelstein and R.C. Cammearata, eds., "Nanomaterials: Synthesis, Properties and Applications", Institute of Physics Publishing, Bristol and Philadelphia, 1996.
2. N John Dinardo, "Nanoscale characterizations of surfaces & Interfaces", 2nd edition,
3. Weinheim Cambridge, Wiley-VCH, 2000

3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, 2001.
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, 2004.
5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003).

PTGE 2071

INTELLECTUAL PROPERTY RIGHTS (IPR)

L T P C

3 0 0 3

UNIT I

5

Introduction – Invention and Creativity – Intellectual Property (IP) – Importance – Protection of IPR – Basic types of property (i. Movable Property ii. Immovable Property and iii. Intellectual Property).

UNIT II

10

IP – Patents – Copyrights and related rights – Trade Marks and rights arising from Trademark registration – Definitions – Industrial Designs and Integrated circuits – Protection of Geographical Indications at national and International levels – Application Procedures.

UNIT III

10

International convention relating to Intellectual Property – Establishment of WIPO – Mission and Activities – History – General Agreement on Trade and Tariff (GATT).

UNIT IV

10

Indian Position Vs WTO and Strategies – Indian IPR legislations – commitments to WTO-Patent Ordinance and the Bill – Draft of a national Intellectual Property Policy – Present against unfair competition.

UNIT V

10

Case Studies on – Patents (Basumati rice, turmeric, Neem, etc.) – Copyright and related rights – Trade Marks – Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Subbaram N.R. " Handbook of Indian Patent Law and Practice ", S. Viswanathan (Printers and Publishers) Pvt. Ltd., 1998.

REFERENCES

1. Eli Whitney, United States Patent Number : 72X, Cotton Gin, March 14, 1794.
2. Intellectual Property Today : Volume 8, No. 5, May 2001, [www.iptoday.com].
3. Using the Internet for non-patent prior art searches, Derwent IP Matters, July 2000. [www.ipmatters.net/features/000707_gibbs.html].

UNIT I	9
Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.	
UNIT II	9
Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.	
UNIT III	9
State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.	
UNIT IV	9
Indian Federal System – Center – State Relations – President’s Rule – Constitutional Amendments – Constitutional Functionaries - Assessment of working of the Parliamentary System in India.	
UNIT V	9
Society : Nature, Meaning and definition; Indian Social Structure; Caste, Religion, Language in India; Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.	

TOTAL: 45 PERIODS

TEXT BOOKS:

- 1 .Durga Das Basu, “ Introduction to the Constitution of India “, Prentice Hall of India, New Delhi.
1. R.C.Agarwal, “ (1997) Indian Political System “, S.Chand and Company, New Delhi.
2. Maciver and Page, “ Society: An Introduction Analysis “, Mac Milan India Ltd., New Delhi.
3. K.L.Sharma, “ (1997) Social Stratification in India: Issues and Themes “, Jawaharlal Nehru University, New Delhi.

REFERENCES:

1. Sharma, Brij Kishore, “ Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
2. U.R.Gahai, “ (1998) Indian Political System “, New Academic Publishing House, Jalaendhar.
3. R.N. Sharma, “ Indian Social Problems “, Media Promoters and Publishers Pvt. Ltd.
4. Yogendra Singh, “ (1997) Social Stratification and Charge in India “, Manohar, New Delhi.

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- Basic principles of Traffic Flow.

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 'At Grade Intersections, - Channallised Intersections - Principles of Intersection Design, Elements of Intersection Design, Rotary design, Grade Separation and interchanges - Design principles.

UNIT V TRAFFIC MANAGEMENT 9

Traffic Management- Transportation System Management (TSM) - 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 Intelligent Transportation System (ITS).

TOTAL: 45 PERIODS**TEXT BOOKS:**

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

REFERENCES:

1. Indian Roads Congress (IRC) specifications: Guidelines and special publications on Traffic Planning and Management
2. Guidelines of Ministry of Road Transport and Highways, Government of India.
3. Subhash C.Saxena, A Course in Traffic Planning and Design, Dhanpat Rai Publications, New Delhi, 1989.
4. Transportation Engineering – An Introduction, C.Jotin Khisty, B.Kent Lall, Prentice Hall of India Pvt Ltd, 2006.

OBJECTIVE

The objective of the course is to train the students to have a comprehensive knowledge of planning, design, evaluation, construction and financing of housing projects. The course focuses on cost effective construction materials and methods. Emphasis has also been given on the principles of sustainable housing policies and programmes.

UNIT I INTRODUCTION TO HOUSING 9

Definition of Basic Terms – House, Home, Household, Apartments, Multi storeyed Buildings, Special Buildings, Objectives and Strategies of National Housing Policies, Principle of Sustainable Housing, Housing Laws at State level, Bye-laws at Urban and Rural Local Bodies – levels - Development Control Regulations, Institutions for Housing at National, State and Local levels

UNIT II HOUSING PROGRAMMES 9

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighborhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes, Role of Public, Private and Non-Government Organizations

UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS 9

Formulation of Housing Projects – Site Analysis, Layout Design, Design of Housing Units (Design Problems)

UNIT IV CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS 9

New Constructions Techniques – Cost Effective Modern Construction Materials, Building Centers – Concept, Functions and Performance Evaluation

UNIT V HOUSING FINANCE AND PROJECT APPRAISAL 9

Appraisal of Housing Projects – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing of Housing Units, Rents, Recovery Pattern (Problems).

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Meera Mehta and Dinesh Mehta, Metropolitan Housing Markets, Sage Publications Pvt. Ltd., New Delhi, 1999.
2. Francis Cherunilam and Odeyar D Heggade, Housing in India, Himalaya Publishing House, Bombay, 1997.

REFERENCES:

1. Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2002.
2. UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS (Habitat), Nairobi, 1994.
3. National Housing Policy, 1994, Government of India.

PTCE 2028

GROUND WATER ENGINEERING

L T P C

3 0 0 3

OBJECTIVE:

To understand the distribution of ground water, evaluation of aquifer parameters, solving ground water equations. Ground water quality and development of ground water methods are dealt.

UNIT I FUNDAMENTALS OF GROUND WATER 9

Introduction – Characteristic of Ground water – Distribution of water - ground water column –Permeability - Darcy's Law - Types of aquifers - Hydrogeological Cycle – water level fluctuations.

UNIT II HYDRAULICS OF FLOW 9

Storage coefficient - Specific field - Heterogeneity and Anisotropy -Transmissivity - Governing equations of ground water flow - Steady state flow - Dupuit Forchheimer assumptions - Velocity potential - Flow nets

UNIT III ESTIMATION OF PARAMETERS 9

Transmissivity and Storativity – Pumping test - Unsteady state flow - Thiess method - Jacob method - Image well theory – Effect of partial penetrations of wells - Collectors wells.

UNIT IV GROUND WATER DEVELOPMENT 9

Infiltration gallery - Conjunctive use - Artificial recharge Rainwater harvesting - Safe yield -Yield test – Geophysical methods – Selection of pumps.

UNIT V WATER QUALITY 9

Ground water chemistry - Origin, movement and quality - Water quality standards - Saltwater intrusion –Environmental concern

TOTAL: 45 PERIODS

TEXT BOOKS

1. Raghunath H.M., “Ground Water Hydrology”, Wiley Eastern Ltd., 2000.
2. Todd D.K., “Ground Water Hydrology”, John Wiley and Sons, 2000.

REFERENCE

1. C Walton, “Ground Water Resource Evaluation”, McGraw-Hill Publications.

PTCE2029

MANAGEMENT OF IRRIGATION SYSTEMS

L T P C

3 0 0 3

OBJECTIVE:

At the end of the semester, the student shall have a clear concept of irrigation water management practices of the past, present and future. He/she shall also be able to appreciate the importance due and duly given to stake holders.

UNIT I IRRIGATION SYSTEM REQUIREMENTS 9

Irrigation systems – Supply and demand of water – Cropping pattern – Crop rotation – Crop diversification – Estimation of total and peak crop water requirements – Effective and dependable rainfall – Irrigation efficiencies.

UNIT II	IRRIGATION SCHEDULING	8
Time of irrigation – Critical stages of water need of crops – Criteria for scheduling irrigation – Frequency and interval of irrigation.		
UNIT III	MANAGEMENT	9
Structural and non-structural strategies in water use and management – Conjunctive use of surface and ground waters – Quality of irrigation water.		
UNIT IV	OPERATION	9
Operational plans – Main canals, laterals and field channels – Water control and regulating structures – Performance indicators – Case study		
UNIT V	INVOLVEMENT OF STAKE HOLDERS	10
Farmer’s participation in System operation – Water user’s associations – Farmer councils – Changing paradigms on irrigation management – Participatory irrigation management		
		TOTAL: 45 PERIODS

TEXT BOOKS

1. Dilip Kumar Majumdar, “Irrigation Water Management – Principles and Practice”, Prentice Hall of India Pvt. Ltd., New Delhi, 2000
2. Hand book on Irrigation Water Requirement, R.T. Gandhi, et. al., Water Management Division, Department of Agriculture, Ministry of Agriculture, New Delhi

REFERENCES:

1. Hand Book on Irrigation System Operation Practices, Water Resources Management and Training Project, Technical report No. 33, CWC, New Delhi, 1990
2. Maloney, C. and Raju, K.V., “Managing Irrigation Together”, Practice and Policy in India, Stage Publication, New Delhi, India, 1994.

PTCE 2030	COASTAL ZONE MANAGEMENT	L T P C
		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	10
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 – Wave force on structures – Vertical – Sloping and stepped barriers – Force on piles.		

UNIT IV	RESERVOIR PLANNING AND MANAGEMENT	9
Reservoir - Single and multipurpose – Multi objective - Fixation of Storage capacity - Strategies for reservoir operation - Sedimentation of reservoirs - Design flood-levees and flood walls - Channel improvement.		
UNIT V	ECONOMIC ANALYSIS	9
Estimation of cost and Evaluation of Benefits - Discount rate - Discounting factors - Discounting techniques – Computer Applications.		
		TOTAL: 45 PERIODS

TEXT BOOKS

1. Linsley R.K. and Franzini J.B, “Water Resources Engineering”, McGraw-Hill Inc, 2000.
2. Douglas J.L. and Lee R.R., “Economics of Water Resources Planning”, Tata McGraw-Hill Inc. 2000.
3. Duggal, K.N. and Soni, J.P., “Elements of Water Resources Engineering”, New Age International Publishers

REFERENCES

1. Chaturvedi M.C., “Water Resources Systems Planning and Management”, Tata McGraw-Hill Inc., New Delhi, 1997.
2. Goodman Alvin S., “Principles of Water Resources Planning”, Prentice-Hall, 1984.
3. Maass et al. Design of Water Resources Systems, Macmillan, 1968.

PTCE 2032	PAVEMENT ENGINEERING	L T P C
		3 0 0 3

OBJECTIVE

Student gains knowledge on various IRC guidelines for designing flexible and rigid pavements. Further, he/she will be in a position to assess quality and serviceability conditions of roads.

UNIT I	TYPE OF PAVEMENT AND STRESS DISTRIBUTION ON LAYERED SYSTEM	9
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Introduction - Pavement as layered structure - Pavement types - flexible and rigid - Stress and deflections in pavements under repeated loading

UNIT II	DESIGN OF FLEXIBLE PAVEMENTS	9
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Flexible pavement design - Empirical - Semi empirical and theoretical Methods - Design procedure as per latest IRC guidelines – Design and specification of rural roads

UNIT III	DESIGN OF RIGID PAVEMENTS	9
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Cement concrete pavements - Modified Westergard approach - Design procedure as per latest IRC guidelines - Joints in rigid pavements - Concrete roads and their scope in India.

UNIT IV	PERFORMANCE EVALUATION AND MAINTENANCE	9
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Pavement Evaluation [Condition and evaluation surveys (Surface Appearance, Cracks, Patches And Pot Holes, Undulations, Ravelling, Roughness, Skid Resistance), Structural Evaluation By Deflection Measurements, Present Serviceability Index] Pavement maintenance. [IRC Recommendations Only]

UNIT V STABILISATION OF PAVEMENTS**9**

Stabilisation with special reference to highway pavements - Choice of stabilisers - Testing and field control –Stabilisation for rural roads in India -use of Geosynthetics (geotextiles & geogrids) in roads.

TOTAL: 45 PERIODS**TEXT BOOKS**

1. Kadiyali, L.R., "Principles and Practice of Highway Engineering", Khanna tech. Publications, New Delhi, 1989.
2. Wright, P.H., "Highway Engineers", John Wiley & Sons, Inc., New York, 1996
3. Design and Specification of Rural Roads (Manual), Ministry of rural roads, Government of India, New Delhi, 2001

REFERENCES

1. Yoder R.J and Witczak M.W., "Principles of Pavement Design", John Wiley, 1975.
2. Guidelines for the Design of Flexible Pavements, IRC:37 - 2001, The Indian roads Congress, New Delhi.
3. Guideline for the Design of Rigid Pavements for Highways, IRC:58-1998, The Indian Roads Congress, New Delhi.

PTCE2033**GROUND IMPROVEMENT TECHNIQUES****L T P C
3 0 0 3****OBJECTIVE**

After this course, the student is expected to identify basic deficiencies of various soil deposits and he/she be in a position to decide various ways and means of improving the soil and implementing techniques of improvement.

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 electroosmotic methods - Seepage analysis for two dimensional flow-fully and partially penetrating slots in homogenous deposits (Simple cases only).

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

Insitu densification of cohesionless and consolidation of cohesive soils -Dynamic compaction and consolidation - Vibrofloatation - 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.

TEXT BOOKS:

1. S.Prakesh & V.K Puri, Foundation for machines, McGraw-Hill 1993
2. Srinivasulu, P & Vaidyanathan, Hand book of Machine Foundations, McGraw-Hill, 1996

REFERENCES:

1. Swamisaran, "Soil Dynamics and Machine Foundations", Galgotia Publications Pvt. Ltd., 1999
2. Kramar S.L, "Geotechnical Earthquake Engineering", Prentice Hall International series, Pearson Education (Singapore) Pvt. Ltd.
3. Kameswara Rao, "Dynamics Soil Tests and Applications", Wheeler Publishing, New Delhi, 2003
4. Kameswara Rao, "Vibration Analysis and Foundation Dynamics", Wheeler Publishing, New Delhi, 1998
5. IS code of Practice for Design and Construction of Machine Foundations, McGraw Hill, 1996.
6. Moore P.J., "Analysis and Design of Foundation for Vibration", Oxford and IBH, 1995.

PTCE 2035**ROCK ENGINEERING****L T P C****3 0 0 3****OBJECTIVE**

Student gains the knowledge on the mechanics of rock and its applications in underground structures and rock slope stability analysis.

UNIT I CLASSIFICATION AND INDEX PROPERTIES OF ROCKS 7
Geological classification – Index properties of rock systems – Classification of rock masses for engineering purpose.

UNIT II ROCK STRENGTH AND FAILURE CRITERIA 11
Modes of rock failure – Strength of rock – Laboratory and field measurement of shear, tensile and compressive strength – Stress strain behaviour in compression – Mohr-coulomb failure criteria and empirical criteria for failure – Deformability of rock.

UNIT III INITIAL STRESSES AND THEIR MEASUREMENTS 10
Estimation of initial stresses in rocks – influence of joints and their orientation in distribution of stresses – technique for measurements of insitu stresses.

UNIT IV APPLICATION OF ROCK MECHANICS IN ENGINEERING 9
Simple engineering application – Underground openings – Rock slopes – Foundations and mining subsidence.

UNIT V ROCK BOLTING 8
Introduction – Rock bolt systems – rock bolt installation techniques – Testing of rock bolts – Choice of rock bolt based on rock mass condition.

TOTAL: 45 PERIODS**TEXT BOOKS**

1. Goodman P.E., "Introduction to Rock Mechanics", John Wiley and Sons, 1999.
2. Stillborg B., "Professional User Handbook for rock Bolting", Tran TechPublications, 1996.

REFERENCES:

1. Brow E.T., "Rock Characterisation Testing and Monitoring", Pergaman Press, 1991.
2. Arogyaswamy R.N.P., "Geotechnical Application in Civil Engineering", Oxford and IBH, 1991.
3. Hock E. and Bray J., "Rock Slope Engineering, Institute of Mining and Metallurgy", 1991.

**PTCE 2036 ENVIRONMENTAL IMPACT ASSESSMENT OF CIVIL ENGINEERING PROJECTS L T P C
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 8

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

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 10

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

TOTAL: 45 PERIODS

TEXT BOOKS

1. Canter, R.L., "Environmental Impact Assessment", McGraw-Hill Inc., New Delhi, 1996.
2. Shukla, S.K. and Srivastava, P.R., "Concepts in Environmental Impact Analysis", Common Wealth Publishers, New Delhi, 1992.

REFERENCES

1. John G. Rau and David C Hooten (Ed)., "Environmental Impact Analysis Handbook", McGraw-Hill Book Company, 1990.
2. "Environmental Assessment Source book", Vol. I, II & III. The World Bank, Washington, D.C., 1991.
3. Judith Petts, "Handbook of Environmental Impact Assessment Vol. I & II", Blackwell Science, 1999.

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 8

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 8

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 11

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 – Secure land fills

TOTAL: 45 PERIODS

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, New Delhi, 2000.

REFERENCES

1. T.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.

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 12

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 8

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 7

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

TOTAL: 45 PERIODS**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.
3. Rao M.N., and Rao H. V. N., Air Pollution Control, Tata-McGraw-Hill, New Delhi, 1996.

REFERENCES:

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

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 PERIODS**TEXT BOOKS**

1. George Tchobanoglous et.al., "Integrated Solid Waste Management", McGraw-Hill Publishers, 1993.
2. B.Bilitewski, G.HardHe, K.Marek, A.Weissbach, and H.Boeddicker, "Waste Management", Springer, 1994.

REFERENCES

1. Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2000
2. 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 Developing Countries", INSDOC, 1993.

OBJECTIVE:

This subject deals with the scope and applications of ecological principles for wastewater treatment and reuse. The student is expected to be aware of the various effects of industrialisation on ecology and ecological based waste purification methods.

UNIT I PRINCIPLES AND CONCEPTS 9

Scope and applications of Ecological Engineering – Development and evolution of ecosystems – principles and concepts pertaining to species, populations and community

UNIT II ECOSYSTEM FUNCTIONS 10

Energy flow and nutrient cycling – Food chain and food webs – biological magnification, diversity and stability, immature and mature systems. Primary productivity – Biochemical cycling of nitrogen, phosphorous, sulphur and carbon dioxide; Habitat ecology - Terrestrial, fresh water, estuarine and marine habitats.

UNIT III ECOLOGICAL ENGINEERING METHODS 9

Bio monitoring and its role in evaluation of aquatic ecosystem; Rehabilitation of ecosystems through ecological principles – step cropping, bio-wind screens, Wetlands, ponds, Root Zone Treatment for wastewater, Reuse of treated wastewater through ecological systems.

UNIT IV ECOLOGICAL EFFECTS OF INDUSTRIALISATION 9

Ecological effects of exploration, production, extraction, processing, manufacture & transport.

UNIT V CASE STUDIES 8

Case studies of integrated ecological engineering systems

TOTAL: 45 PERIODS

TEXT BOOKS

1. Odum, E.P., "Fundamental of Ecology", W.B.Sauders, 1990.
2. Kormondy, E.J., "Concepts of Ecology", Prentice Hall, New Delhi, 1996

REFERENCES

1. Mitch, J.W. and Jorgensen, S.E., Ecological Engineering – An Introduction to Ecotechnology, John Wiley and Sons, 1996.
2. Colinvaux, P., Ecology, John Wiley and Sons, 1996.
3. Etnier, C & Guterstam, B., "Ecological Engineering for Wastewater Treatment", 2nd Edition, Lewis Publications, London, 1996.

UNIT I CONSTRUCTION CONTRACTS 9

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

UNIT II	TENDERS	10
Prequalification – Bidding – Accepting – Evaluation of Tender from Technical, Contractual and Commercial Points of View – Contract Formation and Interpretation – Potential Contractual Problems – World Bank Procedures and Guidelines – Transparency in Tenders Act.		
UNIT III	ARBITRATION	8
Comparison of Actions and Laws – Agreements – Subject Matter – Violations – Appointment of Arbitrators – Conditions of Arbitration – Powers and Duties of Arbitrator – Rules of Evidence – Enforcement of Award – Costs		
UNIT IV	LEGAL REQUIREMENTS	9
Insurance and Bonding – Laws Governing Sale, Purchase and Use of Urban and Rural Land – Land Revenue Codes – Tax Laws – Income Tax, Sales Tax, Excise and Custom Duties and their Influence on Construction Costs – Legal Requirements for Planning – Property Law – Agency Law – Local Government Laws for Approval – Statutory Regulations		
UNIT V	LABOUR REGULATIONS	9
Social Security – Welfare Legislation – Laws relating to Wages, Bonus and Industrial Disputes, Labour Administration– Insurance and Safety Regulations – Workmen’s Compensation Act – Indian Factory Act – Tamil Nadu Factory Act – Child Labour Act - Other Labour Laws		

TOTAL: 45 PERIODS

REFERENCES

1. Gajaria G.T., Laws Relating to Building and Engineering Contracts in India, M.M.Tripathi Private Ltd., Bombay, 1982
2. Tamilnadu PWD Code, 1986
3. Jimmie Hinze, Construction Contracts, Second Edition, McGraw Hill, 2001
4. Joseph T. Bockrath, Contracts and the Legal Environment for Engineers and Architects, Sixth Edition, McGraw Hill, 2000.

PTCE 2041	BRIDGE STRUCTURES	L T P C
		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 and dead load shear forces - cable zone in girder - Check for stresses at various sections - Check for diagonal tension - Diaphragms - End block - Short term and long term deflections.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Johnson Victor D., "Essentials of Bridge Engineering", Oxford and IBH Publishing Co., New Delhi, 1990.
2. Rajagopalan, N. Bridge Superstructure, Alpha Science International, 2006

REFERENCES

1. Phatak D.R., "Bridge Engineering", Satya Prakashan, New Delhi, 1990.
2. Ponnuswamy S., "Bridge Engineering", Tata McGraw-Hill, New Delhi, 1996.

PTCE 2042

STORAGE STRUCTURES

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

OBJECTIVE:

The main objective of this course is to impart the principles involved in designing structures which have to store different types of materials. The student at the end of the course shall be able to design concrete and steel material retaining structures.

UNIT I STEEL WATER TANKS 12

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 12

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 7
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 7
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 7
Principles of circular prestressing – Design of prestressed concrete circular water tanks

TOTAL: 45 PERIODS

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.

PTCE 2043 DESIGN OF PLATE AND SHELL STRUCTURES L T P C
3 0 0 3

OBJECTIVE

At the end of this course the student shall understand the rudimentary principles involved in the analysis and design of plates and shells.

UNIT I THIN PLATES WITH SMALL DEFLECTION 9
Laterally loaded thin plates – governing differential equations – Simply supported and fixed boundary conditions

UNIT II RECTANGULAR PLATES 9
Simply supported rectangular plates – Navier’s solution and Levy’s method.

UNIT III THIN SHELLS 9
Classification of shells-structural actions – membrane theory

UNIT IV ANALYSIS OF SHELLS 9
Analysis of spherical dome – cylindrical shells – folded plates

UNIT V DESIGN OF SHELLS 9
Design of spherical dome – cylindrical shells – folded plates

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Bairagi N K, A text book of Plate Analysis, Khanna Publishers, New Delhi, 1996.
2. G.S. Ramaswamy, Design and Construction of Shell Structures, CBS Plublishers, New Delhi, 1996
3. S. Timoshenko & S. Woinowsky – Krieger, “Theory of Plates and Shells”, McGraw Hill Book Company

REFERENCES:

1. Szilard R, Theory and analysis of plates, Prentice Hall Inc, 1995
2. Chatterjee B. K., Theory and Design of Concrete Shells, Oxford & IBH, New Delhi, 1998
3. Billington D. P., Thin Shell Concrete Structures, McGraw-Hill, 1995.

PTCE 2044**TALL BUILDINGS****L T P C
3 0 0 3****OBJECTIVE**

At the end of this course the student should have understood the problems associated with large heights of structures with respect to loads (wind and earthquake and deflections of the structure). He should know the rudimentary principles of designing tall buildings as per the existing course.

UNIT I INTRODUCTION**9**

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

UNIT II THE VERTICAL STRUCTURE PLANE**9**

Dispersion of Vertical Forces- Dispersion of Lateral Forces - Optimum Ground Level Space - Shear Wall Arrangement - Behaviour of Shear Walls under Lateral Loading. The Floor Structure or Horizontal Building Plane Floor Framing Systems-Horizontal Bracing- Composite Floor Systems The High - Rise Building as related to assemblage Kits Skeleton Frame Systems - Load Bearing Wall Panel Systems - Panel – Frame Systems - Multistory Box Systems.

UNIT III COMMON HIGH-RISE BUILDING STRUCTURES AND THEIR BEHAVIOUR UNDER LOAD**9**

The Bearing Wall Structure- The Shear Core Structure - Rigid Frame Systems- The Wall - Beam Structure: Interspatial and Staggered Truss Systems - Frame - Shear Wall Building Systems - Flat Slab Building Structures - Shear Truss - Frame Interaction System with Rigid - Belt Trusses - Tubular Systems-Composite Buildings - Comparison of High - Rise Structural Systems Other Design Approaches Controlling Building Drift Efficient Building Forms - The Counteracting Force or Dynamic Response.

UNIT IV APPROXIMATE STRUCTURAL ANALYSIS AND DESIGN OF BUILDINGS**9**

Approximate Analysis of Bearing Wall Buildings The Cross Wall Structure - The Long Wall Structure The Rigid Frame Structure Approximate Analysis for Vertical Loading - Approximate Analysis for Lateral Loading - Approximate Design of Rigid Frame Buildings-Lateral Deformation of Rigid Frame Buildings The Rigid Frame - Shear Wall Structure - The Vierendeel Structure - The Hollow Tube Structure.

UNIT V OTHER HIGH-RISE BUILDING STRUCTURE 9
 Deep - Beam Systems -High-Rise Suspension Systems - Pneumatic High -Rise Buildings - Space Frame Applied to High - Rise Buildings - Capsule Architecture.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. WOLFGANG SCHUELLER " High - rise building Structures", John Wiley and Sons, New York 1976.
2. Bryan Stafford Smith and Alex Coull, " Tall Building Structures ", Analysis and Design, John Wiley and Sons, Inc., 1991.

REFERENCES

1. COULL, A. and SMITH, STAFFORD, B. " Tall Buildings ", Pergamon Press, London, 1997.
2. LinT.Y. and Burry D.Stotes, " Structural Concepts and Systems for Architects and Engineers ", John Wiley, 1994.
3. Lynn S.Beedle, Advances in Tall Buildings, CBS Publishers and Distributors, Delhi, 1996.
4. Taranath.B.S., Structural Analysis and Design of Tall Buildings, Mc Graw Hill,1998.

PTCE 2045 PREFABRICATED STRUCTURES L T P C
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 coordinate on – 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 JOINT 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 PERIODS

TEXT BOOKS:

1. CBRI, Building materials and components, India, 1990
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., Knowledge based process planning 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 concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 1978.

**PTCE 2046 WIND ENGINEERING L T P C
 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 PERIODS

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.

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 some of the 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 – Acoustics – 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 PERIODS

TEXT BOOKS

1. Reinforced Concrete Structural elements – P. Purushothaman.
2. 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, Bureau of Indian Standards, New Delhi 1990.
3. Course Notes on Modern Developments in the Design and Construction of Industrial Structures, Structural Engineering Research Centre, Madras, 1982.
4. Koncz, J, Manual of Precast Construction Vol I & II Bauverlay GMBH, 1971.

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 LVOT – 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 rheological Fluids– Electro magnetic 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 PERIODS

TEXT BOOKS

1. Brain Culshaw – Smart Structure and Materials Artech House – Borton. London 1996.

REFERENCES

1. L. S. Srinath – Experimental Stress Analysis – Tata McGraw-Hill, 1998.
2. J. W. Dally & W. F. Riley – Experimental Stress Analysis – Tata McGraw-Hill, 1998.

PTCE 2050

FINITE ELEMENT TECHNIQUES

**L T P C
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 finite element method.

UNIT I INTRODUCTION – VARIATIONAL FORMULATION 9
General field problems in Engineering – Modelling – Discrete and Continuous models – Characteristics – Difficulties involved in solution – The relevance and place of the finite element method – Historical comments – Basic concept of FEM, Boundary and initial value problems – Gradient and divergence theorems – Functionals – Variational calculus Variational formulation of VBPS. The method of weighted residuals – The Ritz method.

UNIT II FINITE ELEMENT ANALYSIS OF ONE DIMENSIONAL PROBLEMS 10

One dimensional second order equations – discretisation of domain into elements – Generalised coordinates approach – derivation of elements equations – assembly of elements equations – imposition of boundary conditions – solution of equations – Cholesky method – Post processing – Extension of the method to fourth order equations and their solutions – time dependant problems and their solutions – example from heat transfer, fluid flow and solid mechanics.

UNIT III FINITE ELEMENT ANALYSIS OF TWO DIMENSIONAL PROBLEMS 10

Second order equation involving a scalar-valued function – model equation – Variational formulation – Finite element formulation through generalised coordinates approach – Triangular elements and quadrilateral elements – convergence criteria for chosen models – Interpolation functions – Elements matrices and vectors – Assembly of element matrices – boundary conditions – solution techniques.

UNIT IV ISOPARAMETRIC ELEMENTS AND FORMULATION 8

Natural coordinates in 1, 2 and 3 dimensions – use of area coordinates for triangular elements in - 2 dimensional problems – Isoparametric elements in 1,2 and 3 dimensional Lagrangean and serendipity elements – Formulations of elements equations in one and two dimensions - Numerical integration.

UNIT V APPLICATIONS TO FIELD PROBLEMS IN TWO DIMENSIONALS 8

Equations of elasticity – plane elasticity problems – axisymmetric problems in elasticity – Bending of elastic plates – Time dependent problems in elasticity – Heat – transfer in two dimensions – incompressible fluid flow

TOTAL: 45 PERIODS

TEXT BOOK:

1. Chandrupatla, T.R., and Belegundu, A.D., “Introduction to Finite Element in Engineering”, Third Edition, Prentice Hall, India, 2003.

REFERENCES:

1. J.N.Reddy, “An Introduction to Finite Element Method”, McGraw-Hill, Intl. Student Edition, 1985.
2. Zienkiewics, “The finite element method, Basic formulation and linear problems”, Vol.1, 4/e, McGraw-Hill, Book Co.
3. S.S.Rao, “The Finite Element Method in Engineering”, Pergaman Press, 2003.
4. C.S.Desai and J.F.Abel, “Introduction to the Finite Element Method”, Affiliated East West Press, 1972.

