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	Applied Mathematics	3	0	0	3
2	PTPH 2111	Applied Physics	3	0	0	3
3	PTCY 2111	Applied Chemistry	3	0	0	3
4	PTGE 2111	Fundamentals of Computing	3	0	0	3
5	PTCE 2201	Strength of Materials–I	3	0	0	3
		TOTAL	15	0	0	15

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1	PTMA 2211	Mathematics – II	3	0	0	3
2	PTCE 2202	Fluid Mechanics	3	0	0	3
3	PTCE 2251	Strength of Materials – II	3	0	0	3
4	PTCE 2254	Surveying – II	3	0	0	3
5	PTCE 2257	Survey Practicals - II	0	0	4	2
		TOTAL	12	0	4	14

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1	PTCE 2301	Structural Analysis – I	3	0	0	3
2	PTGE 2261	Environmental Science and Engineering	3	0	0	3
3	PTCE 2255	Soil Mechanics	3	0	0	3
4	PTCE 2305	Highway Engineering	3	0	0	3
5	PTCE 2205	Computer Aided Building Drawing (Practical)	0	0	4	2
		TOTAL	12	0	4	14

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1	PTCE 2302	Design of Steel Structures	3	0	0	3
2	PTCE 2304	Water Supply Engineering	3	0	0	3
3	PTCE 2351	Structural Analysis – II	3	0	0	3
4	PTCE 2253	Applied Hydraulics Engineering	3	0	0	3
5	PTCE 2405	Railways and Airports Engineering	3	0	0	3
		TOTAL	15	0	0	15

SEMESTER V

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1	PTCE 2353	Design of Reinforced Cement Concrete and Masonry Structures	3	0	0	3
2	PTCE 2354	Waste Water Engineering	3	0	0	3
3	PTCE 2303	Foundation Engineering	3	0	0	3
4		Elective – I	3	0	0	3
5	PTCE 2356	Computer Aided Structural Engineering Drawing (Practical)	0	0	4	2
		TOTAL	**12**	**0**	**4**	**14**

SEMESTER VI

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1	PTCE 2404	Estimation, Costing and Valuation Engineering	3	0	0	3
2	PTCE 2352	Irrigation Engineering	3	0	0	3
3		Elective – II	3	0	0	3
4		Elective – III	3	0	0	3
5	PTCE 2355	Fundamentals of Remote Sensing and GIS	3	0	0	3
		TOTAL	**15**	**0**	**0**	**15**

SEMESTER VII

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1	PTCE 2401	Principles of Management	3	0	0	3
2	PTCE 2402	Structural Dynamics and Earthquake Engineering	3	0	0	3
3		Elective – IV	3	0	0	3
4	PTCE 2451	Project Work	0	0	12	6
		TOTAL	**9**	**0**	**12**	**15**

TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE = 102

ELECTIVES FOR B.E CIVIL ENGINEERING

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
		STRUCTURES				
1	PTCE 2021	Bridge Structures	3	0	0	3
2	PTCE 2022	Prefrabricated Structures	3	0	0	3
3	PTCE 2023	Computer Aided Design of Structures	3	0	0	3
4	PTCE 2024	Maintenance and Rehabilitation of Structures	3	0	0	3
5	PTCE 2025	Storage Structures	3	0	0	3
6	PTCE 2026	Design of Plate and Shell Structures	3	0	0	3
7	PTCE 2027	Prestressed Concrete Structures	3	0	0	3
8	PTCE 2028	Industrial Structures	3	0	0	3
9	PTCE 2029	Tall Structures	3	0	0	3
10	PTCE 2030	Wind Engineering	3	0	0	3
11	PTCE 2031	Smart Materials and Structures	3	0	0	3
12	PTCE 2032	Finite Element Techniques	3	0	0	3
		HYDROLOGY AND WATER RESOURCES ENGINEERING				
13	PTCE 2033	Groundwater Engineering	3	0	0	3
14	PTCE 2034	Water Resources Systems	3	0	0	3
15	PTCE 2035	Mathematical Modeling in Water Resources Engineering	3	0	0	3
16	PTCE 2036	Integrated Water Resources Management	3	0	0	3
17	PTCE 2037	Participatory Water Management	3	0	0	3
18	PTCE 2038	Watershed Conservation And Management	3	0	0	3
19	PTCE 2306	Hydrology and Water Resources Engineering	3	0	0	3
		TRANSPORTATION ENGINEERING				
20	PTCE 2039	Transportation Planning and Systems	3	0	0	3
21	PTCE 2040	Traffic Engineering and Management	3	0	0	3
22	PTCE 2041	Transportation Engineering - Docks and Harbours	3	0	0	3
23	PTCE 2042	Transport and Environment	3	0	0	3
24	PTCE 2043	Pavement Management Systems	3	0	0	3
25	PTCE 2044	Computer Applications in Highway and Transportation Engineering	3	0	0	3
26	PTCE 2045	Advanced Highway Engineering	3	0	0	3
		ENVIRONMENTAL ENGINEERING				
27	PTCE 2046	Environmental Impact Assessment	3	0	0	3
28	PTCE 2047	Global Climate Change	3	0	0	3
29	PTCE 2048	Municipal Solid Waste Management	3	0	0	3
30	PTCE 2049	Industrial Wastewater Pollution-Prevention and Control	3	0	0	3
31	PTCE 2050	Air Pollution Control	3	0	0	3
		SOIL MECHANICS AND FOUNDATION ENGINEERING				
32	PTCE 2051	Pavement Engineering	3	0	0	3
33	PTCE 2052	Introduction to Soil Dynamics and Machine Foundations	3	0	0	3
34	PTCE 2053	Geotechnical Engineering Processes and Applications	3	0	0	3

#	Code	Course	L	T	P	C
35	PTCE 2054	Rock Engineering	3	0	0	3
36	PTCE 2403	Ground Improvement Techniques	3	0	0	3
	SURVEYING AND REMOTE SENSING		3	0	0	3
37	PTGI 2403	Geographic Information System Applications	3	0	0	3
38	PTGI 2202	Cartography	3	0	0	3
39	PTGI 2254	Electronic Surveying	3	0	0	3
40	PTGI 2353	Cadastral Surveying	3	0	0	3
41	PTGI 2352	Survey Adjustments	3	0	0	3
	GENERAL					
42	PTMA 2261	Probability and Statistics	3	0	0	3
43	PTMA 2262	Numerical Methods	3	0	0	3
44	PTGE 2071	Intellectual Property Rights (IPR)	3	0	0	3
45	PTGE 2072	Indian Constitution and Society	3	0	0	3
46	PTGE 2073	Contract Laws and Regulations	3	0	0	3
47	PTGE 2022	Total Quality Management	3	0	0	3
48	PTGE 2025	Professional Ethics in Engineering	3	0	0	3
49	PTGE 2023	Fundamentals of Nanoscience	3	0	0	3
50	PTAG 2211	Engineering Geology	3	0	0	3
51	PTCE 24 06	Architecture and Town Planning	3	0	0	3

PTMA 2111   **APPLIED MATHEMATICS**
              (Common to all branches of B.E / B.Tech (PT) Programmes)
                                                                    L T P C
                                                                    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   UNCTIONS 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).

PTPH 2111   **APPLIED PHYSICS**
(Common to all branches of B.E / B.Tech (PT) Programmes)

                                                              L T P C
                                                              3 0 0 3

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, CO_2, 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)

PTCY 2111   **APPLIED CHEMISTRY**
(Common to all branches of B.E / B.Tech (PT) Programmes)
L T P C
3 0 0 3

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-factions-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, Helmholts and Gibbs-Helmholts 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

STRY - 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-sacrifical anode-impressed current cathodic protection-surface treatment and protective coating- Catalysis –classification-characteristics of catalysis – auto catalysis- enzyme catalysis

UNIT V   POLYMERS-COMPOSITES AND NANOCHEMISTY   9
Polymers-definition-classification-thermoplastics   and   thermosetting   plastics
differences Preparation, properties and uses of polystyrene, bakelite, PET,
polyurethane, Teflon, ureafromaldehyde, 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

REFERENCE BOOKS

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).

PTGE 2111   FUNDAMENTALS OF COMPUTING   L T P C
3 0 0 3

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.

PTCE 2201   **STRENGTH OF MATERIALS – I**   **L T P C**
                                                        3 0 0 3

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 co-efficient – 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.

PTMA 2211   **MATHEMATICS - II**   **L T P C**
                                                        3 0 0 3

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 BOOK
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,   Lakshmi Publications (P) Limited, New Delhi, 2007.

PTCE 2202   FLUID MECHANICS   L T P C
3 0 0 3
OBJECTIVE:
  - The student is introduced to the mechanics of fluids through a thorough understanding of the properties of the fluids, behaviour of fluids under static conditions. The dynamics of fluids is introduced through the control volume approach which gives an integrated understanding of the transport of mass, momentum and energy. The applications of the conservation laws to a) flow measurements b) flow through pipes (both laminar and turbulent) and c) forces on vanes are studied.

UNIT I   FLUIDS PROPERTIES AND FLUID STATICS   9

Scope of fluid mechanics - Definitions of a fluid - Methods of analysis - Dimensions and units - viscosity, density, perfect gas, vapour pressure and surface tension - Basic equation of fluid statics - Pressure measurements - Manometers. - Forces on plane and curved surfaces - Buoyancy and floatation - Stability of floating bodies - Relative equilibrium.

UNIT II   BASIC CONCEPTS OF FLUID FLOW   9

(a) Kinematics – Methods of describing fluid motion - Classification of flows - Streamline, streak-line and path-lines - Stream function and velocity potentials - Flow nets; (b) Dynamics - Dimensional Concepts of System and Control volume - Application of control volume to continuity, energy and momentum - Euler's equation of motion along a stream line - Bernoulli's equation - Applications to velocity and discharge measurements - Linear momentum equation and moment-of-momentum equations and their applications.

UNIT III   DIMENSIONAL ANALYSIS AND MODEL STUDIES   9

Fundamental dimensions - dimensional homogeneity - Rayleigh's method and Buckingham Pi-Theorem - Dimensionless parameters - Similitude and model studies. Distorted Models.

UNIT IV   INCOMPRESSIBLE VISCOUS FLOW   9

Laminar flow between parallel plates, and pipes - Development of laminar and turbulent flows in pipes - Reynolds experiment - Darcy-Weisbach equation - Moody diagram - Major and minor losses of flow in pipes - Pipes in series and in parallel.

UNIT V   BOUNDARY LAYERS   9

Definition of boundary layers - Displacement, momentum and energy thickness - Laminar and turbulent boundary layers - Momentum integral equation - Separation of boundary layer. Drag and Lift. Lift characteristics of airfoils. Induced drag. Polar Diagram.

TOTAL: 45 PERIODS

TEXT BOOKS
1. Streeter, V.L. and Wylie, E. B., Fluid Mechanics. McGraw Hill, New York, 1983
2. John F.Douglas, Janusz M. Gasiorek and John A.Swaffield, PEARSON Education, India, 2003

REFERENCES
1. Fox W.R. and McDonald A.T., Introduction to Fluid Mechanics John-Wiley and Sons, Singapore, 1995.
2. Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics. Standard Book House. New Delhi, 2000.
3. Roberson J.A and Crowe C.T., Engineering Fluid Mechanics. Jaico Books Mumbai, 2000.

PTCE 2251   **STRENGTH OF MATERIALS – II**   **L T P C**
                                                              3 0 0 3

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

REFERENCES
1. Malhotra, D.R. Gupta, H.C., "The Strength of Materials", Satya Prakashan, Tech. India Publications, New Delhi, 1995.
2. William A.Nash, Theory and Problems of Strength of Materials, Schaum's Outline Series, McGraw Hill International Editions, Third Edition, 1994.
3. 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
4. Andrew Pytel Ferdinard L.Singer, "Strength of Materials", International Student Edition (ISE Reprint), Harper Collins College Division, 1999.
5. Timeshenko, S.P. & Young D.H., "Elements of Strength of Materials, V Edition, affiliated East-West Press Pvt. Ltd. New Delhi, 1998.

PTCE 2254	SURVEYING – II	L T P C
		3 0 0 3

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 – Trignometrical 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   MISCELLANY   12
Electromagnetic distance measurement - Carrier waves - Principles - Instruments - Trilateration –Total Station - GPS Surveying - Hydrographic Surveying - Tides - MSL - Sounding and methods - Location of soundings and methods - Three point problem - Strength of fix - Sextants and station pointer - River surveys - Measurement of current and discharge - Cadastral surveying - Definition - Uses - Legal values - Scales and accuracies.

TOTAL: 45 PERIODS

TEXTBOOKS

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

REFERENCES

1. Clark D., Plane and Geodetic Surveying, Vols. I and II, C.B.S. Publishers and Distributors, Delhi, Sixth Edition, 1971.
2. James M.Anderson and Edward M.Mikhail, Introduction to Surveying, McGraw Hill Book Company, 1985.
3. Wolf P.R., Elements of Photogrammetry, McGraw Hill Book Company, Second Edition, 1986.
4. Robinson A.H., Sale R.D. Morrison J.L. and Muehrche P.C., Elements of Cartography, John Wiley and Sons, New York, Fifth Edition, 1984.
5. Schofield,W., Engineering Surveying, Butterworth –Heinemann, London, 5th Edition, 2001

PTCE 2257   **SURVEY PRACTICALS – II**   **L T P C**
                                                        0 0 4 2

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

PTCE 2301   **STRUCTURAL ANALYSIS - I**   **L T P C**
                                                         3 0 0 3

OBJECTIVE:
- To learn the modern method of analysis of beams and frames.

UNIT I   DEFLECTION OF DETERMINATE STRUCTURES   9
Principles of virtual work for deflections - Deflections of pin-jointed plane frames and rigid plane frames –Williott diagram.

UNIT II   FLEXIBLITY MATRIX METHOD   9
Equilibrium and compatibility - Determinate vs indeterminate structures - Static and Kinematic –Indeterminacy - primary structure - Compatibility conditions - Analysis of indeterminate pin-jointed plane frames, continuous beams, rigid jointed plane frames

UNIT III   SLOPE DEFLECTION METHOD   9
Slope deflection equations- Analysis of continuous beams and rigid frames (with and without sway) - Symmetry and antisymmetry – Simplification for hinged end - Support settlements.

UNIT IV   MOMENT DISTRIBUTION METHOD   9
Stiffness and carry over factors – Distribution and carry over of moments - Analysis of continuous Beams - Plane rigid frames with and without sway.

UNIT V   MATRIX STIFFNESS METHOD   9
Element and global stiffness matrices– Co-ordinate transformations – Rotation matrix-Compatibility matrix – transformations of stiffness matrices, load vectors and displacement vectors – Analysis of Continuous Beams – Analysis of pin-jointed plane frames and rigid frames, by direct stiffness method.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Bhavikatti, S S, "Structural Analysis" Vol.1 and 2, Vikas Publishing House Pvt Ltd., New Delhi-4, 2003.

2. B.C.Punmia, Ashok Kumar Jain & Arun Kumar Jain, "Theory of structures" – Laxmi Publications, New Delhi, 1999.

REFERENCES
1. William Weaver, Jr & James M.Gere, "Matrix analysis of framed structures", CBS Publishers & Distributors, Delhi, 1995
2. Vaidyanathan,R &Perumal,P, "Structural Analysis" Vol.1 & 2 Laxmi Publications, New Delhi,2004
3. Ashok K.Jain, "Advanced Structural Analysis", Nem Chand & Sons, 1996
4. Pandit G.S. and Gupta S.P., "Structural Analysis – A Matrix Approach", Tata McGraw Hill Publishing Company Ltd., 2006
5. Reddy .C.S , "Basic Structural Analysis", Tata McGraw Hill Publishing Company, 2005

PTGE 2261   ENVIRONMENTAL SCIENCE AND ENGINEERING   L T P C
                                                          3 0 0 3

AIM:

To create awareness in every engineering graduate about the importance of environment, the effect of technology on the environment and ecological balance and make them sensitive to the environment problems in every professional endeavour that they participates.

OBJECTIVE:

- At the end of this course the student is expected to understand what constitutes the environment, what are precious resources in the environment, how to conserve these resources, what is the role of a human being in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity. The role of government and non-government organization in environment managements.

UNIT I   ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY   14

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.
Field study of common plants, insects, birds

Field study of simple ecosystems – pond, river, hill slopes, etc.

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.

PTCE 2255   **SOIL MECHANICS**   **L T P C**
                                                                       3 0 0 3
OBJECTIVE:
- To impart knowledge on behaviour and the performance of saturated soil. At the end of this course student attains adequate knowledge in assessing both Physical and Engineering behaviour of soils, mechanism of stress transfer in two-phase systems and stability analysis of slope.

UNIT I   SOIL CLASSIFICATION AND COMPACTION   9
Nature of soil – phase relationships – Soil description and classification for engineering purposes, their significance – BIS Classification system – Soil compaction – Theory, comparison of laboratory and field compaction methods – Factors influencing compaction behaviour of soils.

UNIT II   SOIL WATER AND WATER FLOW   7
Soil water – static pressure in water – capillary stress – Permeability measurement in the laboratory and field – pumping in and pumping out tests – factors influencing permeability of soils – Seepage – introduction to flow net – Simple problems (sheet pile and wier).

UNIT III   STRESS DISTRIBUTION AND SETTLEMENT   11
Effective stress concepts in soils – Stress distribution in soil media – Boussinesq theory - Use of Newmarks influence chart – Components of settlement — immediate and consolidation settlement – Terzaghi's one dimensional consolidation theory – computation of rate of settlement- √t and log t methods - Factors influencing settlement characteristics of soils.

UNIT IV   SHEAR STRENGTH   9
Shear strength of cohesive and cohesionless soils – Mohr – Coulomb failure theory – Measurement of shear strength, direct shear – Triaxial compression, UCC and Vane shear tests – Cyclic loading – Pore pressure parameters.

UNIT V   SLOPE STABILITY   9
Slope failure mechanisms – Types of slopes and infinite slopes – finite slopes – Total stress analysis for saturated clay – Fellenius method - Friction circle method – Use of stability number - slope protection measures.

TOTAL: 45 PERIODS

TEXT BOOKS
1. Murthy, V.N.S., "Textbook of Soil Mechanics and Foundation Engineering", CBS Publishers and Distributors, New Delhi, 2007.
2. Arora K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2002.
3. Gopal Ranjan and Rao A.S.R. "Basic and applied soil mechanics", Wiley Eastern Ltd. New Delhi, 2000.

REFERENCES
1. McCarthy D.F. "Essentials of Soil Mechanics and Foundations". Prentice-Hall, 2002.
2. Coduto, D.P. Geotechnical Engineering – Principles and practices, Prentice Hall of India Pvt.Ltd. New Delhi, 2002.
3. Das, B.M. Principles of Geotechnical Engineering". Thomson Brooks/coles, Singapore, 5th Edition, 2002.

PTCE 2305 **HIGHWAY ENGINEERING** **L T P C**
3 0 0 3

OBJECTIVE:
- To give an overview / basis of highway engineering with respect to the development, planning, design, construction and maintenance of highways.

UNIT I **HIGHWAY PLANNING AND ALIGNMENT** **8**

History of road development in India – Classification of highways – Institutions for Highway planning, design and implementation at different levels – factors influencing highway alignment – Engineering surveys for alignment, objectives, conventional and modern methods.

UNIT II **GEOMETRIC DESIGN OF HIGHWAYS INCLUDING HILL ROADS**
10

Typical cross sections of Urban and Rural roads – Lateral and vertical clearance at underpasses – Cross sectional elements – Horizontal curves, super elevation, transition curves, widening of curves – Sight distances – Vertical curves, gradients, hairpin bends – IRC standards

UNIT III **DESIGN FLEXIBLE AND RIGID PAVEMENTS** **9**

Design principles – pavement components and their role - Design practice for flexible and rigid pavements, (IRC methods only).

UNIT IV **HIGHWAY CONSTRUCTION MATERIALS, EQUIPMENTS AND PRACTICE** **8**

Highway construction materials, properties, testing methods – Construction practice including modern methods, concrete road constructions (problem not included) - Highway drainage – Special considerations for hilly roads.

UNIT V **EVALUATION AND MAINTENANCE OF PAVEMENTS** **10**

Pavement distress in flexible and rigid pavement – Pavement evaluation, roughness, present serviceability index, skid resistance, structural evaluation, evaluation by deflection measurements – Strengthening of pavements –Types of maintenance – IRC standards

TOTAL: 45 PERIODS

TEXT BOOKS
1. Khanna K. and Justo C.E.G., Highway Engineering, Khanna Publishers, Roorkee, 1994.
2. Kadiyali L.R., Principles and practice of Highway Engineering, Khanna Technical Publications, Delhi, 1997.
3. Indian Road Congress (IRC), Guidelines and Special Publications of Planning and Design.

REFERENCES
1. Clarkson H Oglesby and R. Gary Hicks, Highway Engineering, John Wileysons, 1992.
2. Blunden W.R and J.A Black, The Land Use Transport Systems, Pergamon Press, 1994.
3. Sharma.S.K Principles, Practices and Design of Highway Engineering, S.Chand and Company Ltd., 1995.
4. Arora.N.L. Transportation Engineering, New India Publishing Home, 1996.
5. Vazirani, V.N and S.P.Chandola, Transportation Engineering, Vol.1. Khanna Publishers, Delhi, 1999.
6. O'Flaherty.C.A Highways, Butterworth – Heinemann, Oxford, 2006.

PTCE 2205	COMPUTER AIDED BUILDING DRAWING	L T P C
	(PRACTICAL)	0 0 4 2

OBJECTIVES:
- Building drawing in accordance with development and control rules satisfying orientation and functional requirements for the following:

LIST OF EXPERIMENTS:
1. An approach to planning – Function – Utility – People and their requirements – Extract from Building Rules and Bye- Laws' – Planning of Residential and Public buildings.
2. Complete joinery Details (Paneled and Glazed Doors and Windows) & Codal Provisions.
3. Buildings with load bearing walls (R.C.C roof).
4. Buildings with sloping roof (R.C.C roof and Tiled roof).
5. R.C.C. framed structures.
6. Industrial buildings – North light roof structures – King Post Truss

TOTAL: 60 PERIODS

TEXT BOOKS
1. Sikka V.B. "A Course in Civil Engineering Drawing" 4th Edition, S.K.Kataria and Sons, New Delhi, 1998.
2. George Omura, " Mastering in Autocad 2002"- BPB Publications, New Delhi, 2002

REFERENCES
1. M.G.Shah, C.M.Kale and S.Y.Patki, "Building Drawing with an Integrated Approach to Built Environment",Tata McGraw Hill Publishers Limited ,New Delhi, 2004.
2. B.P.Verma, "Civil Engineering Drawing and House Planning", Khanna Publishers, New Delhi, 1989.
3. K.Venugopal, "Building Drawing", Wiley Eastern Limited, Madras, 2004
4. Murugesan, Padmini Subbarayan, "Civil Engineering Drawing I", Pratheeba Publishers, Coimbatore,1984.
5. K.V.Nataraajan, "Engineering Drawing (BIS Specifications)", Dhanalakshmi Publishers, 2002.
6. Relevant IS Code

PTCE 2302　　　　**DESIGN OF STEEL STRUCTURES**　　　　**L T P C**
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　3 0 0 3

OBJECTIVE:
- To learn the design of Component and structure using steel and timber material subjected to external loading.

UNIT I　　　　**SECTIONS AND JOINTS**　　　　　　　　　　　　　　**12**

Types of steel structures - Properties of rolled steel sections and Light gauge steel sections - Allowable Stresses as per IS code - Riveted and bolted connections - Failures of joints - Single and multiple riveted lap and butt joints under axial and eccentric loading - Strength of fillet and butt welded joints - Design of riveted and welded joints.

UNIT II　　　　**TENSION MEMBERS**　　　　　　　　　　　　　　　　**8**
Design of simple and built-up members subjected to tension - Effective area of angles connected to gussets.

UNIT III　　　　**COMPRESSION MEMBERS**　　　　　　　　　　　　　**8**
Maximum slenderness ratio of various compression members – IS code provision for compression members – Design of simple and built-up compression members with lacings and battens – Design of column bases.

UNIT IV　　　　**BEAMS**　　　　　　　　　　　　　　　　　　　　　**11**
Design of simple beams based on strength and stiffness as per IS code – Design of built – up beams and curtailment of flange plates –Flange splice and web splice- Design of plate girder and stiffeners.

UNIT V　　　　**TIMBER**　　　　　　　　　　　　　　　　　　　　　**6**
Study of properties and strength of natural and laminated timber – Allowable stresses in compression, tension and flexure as per IS Code – Types of joints with nails and bolts – Design of simple compression members as per IS code– Design of beams for strength and stiffness as per IS code.

　　　　　　　　　　　　　　　　　　　　　　　　　　　　　TOTAL: 45 PERIODS

TEXT BOOKS
1. Ram Chandra, Design of Steel Structures, Vol. I, Standard Book house, New Delhi, 1992.
2. Vazirani V.N. and Ratwani M.M. Steel Structures and Timber Structures, Khanna Publishers, New Delhi, 1995.
3. Punmia.B.C., Ashok Kumar Jain, Anand Kumar Jain, "Comprehensive Design of Steel Structures" Lakxmi Publications Pvt. Ltd., 1998.

REFERENCES
1. Kazimi S.M.A and Jindal R.S., Design of Steel Structures, Prentice-Hall of India (P) Ltd., New Delhi, 1990.
2. Ramamrutham S., Design of Steel, Timber and Masonry Structures, Dhanpat Rai and Sons, New Delhi, 1989.
3. Narayanan.R et al., Teaching Resource on Structural Steel Design, INSDAG, Ministry of Steel Publications, 2002.
4. Duggal.S.K., "Design of Steel Structures" Tata McGraw Hill Publishing Company, 2005.

PTCE 2304   WATER SUPPLY ENGINEERING   L   T   P   C
**   3   0   0   3**

OBJECTIVE:
- Principles and design of water treatment and distribution will be covered. Relevant BIS codes and GOI Manuals will be referred.

UNIT I   SOURCES OF WATER   9
Public water supply system – Planning, Objectives, Design period, Population forecasting; Water demand – Sources of water and their characteristics, Surface and Groundwater – Impounding Reservoir -Well hydraulics – Development and selection of source – Source Water quality – Characterization – Drinking Water quality standards.

UNIT II   CONVEYANCE FROM THE SOURCE   9
Water supply – intake structures – Functions and drawings; Pipes and conduits for water – Pipe materials – Hydraulics of flow in pipes – Transmission main design-Laying, jointing and testing of pipes –appurtenances- Drawings;– Types and capacity of pumps – Selection of pumps and pipe materials.

UNIT III   WATER TREATMENT   10
Objectives – Unit operations and processes – Principles, functions design and drawing of flash mixers, flocculators, sedimentation tanks and sand filters; Disinfection –THM; Iron and Manganese removal, Defluoridation - Residue Management – Corrosion Control; Construction, Operation and Maintenance aspects-Layout and Hydraulic Profile of water treatment plants.

UNIT IV   ADVANCED WATER TREATMENT   7
Water softening - Desalination -demineralization – Adsorption -Membrane Systems - Construction and Operation & Maintenance aspects – Recent advances.

UNIT V   WATER DISTRIBUTION AND SUPPLY TO BUILDINGS   10
Requirements of water distribution – Components – Selection of pipes material - Service reservoirs – Functions and drawings – Network design – Economics – Computer applications – (Analysis of distribution networks) – Appurtenances – operation and maintenance – Leak detection – Principles of design of water supply in buildings – House service connection – Fixtures and fittings; Systems of plumbing and drawings of types of plumbing.

**   TOTAL: 45 PERIODS**

TEXT BOOKS
1. Garg, S.K., Environmental Engineering, Vol.I Khanna Publishers, New Delhi, 2005
2. Modi, P.N. Water Supply Engineering, Vol. I Standard Book House, New Delhi, 2005
3. Punmia, B.C., Ashok Jain and Arun jain, Water Supply Engineering, Laxmi Publications (P) Ltd., New Delhi, 2005.

REFERENCES
1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2003.
2. Syed R.Qasim and Edward M.Motley Guang Zhu, Water Works Engineering Planning, Design and Operation, Prentice Hall of India Private Limited, New Delhi, 2006.

PTCE 2351 **STRUCTURAL ANALYSIS-II** **L T P C**
3 0 0 3

OBJECTIVE:
- To learn the influence lines and its uses in various applications like bridges, arches. Also to learn Plastic analysis of beams and rigid frames.

UNIT I MOVING LOADS AND INFLUENCE LINES 9
Influence lines for reactions in statically determinate structures – influence lines for member 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.

UNIT II INFLUENCE LINES FOR INDETERMINATE STRUCTURES 9
Muller Breslau's principle – Application of Muller Breslau's principle to determinate beams and continuous beams.

UNIT III ARCHES 9
Arches 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 SUSPENSION BRIDGES AND SPACE TRUSSES 9
Analysis of suspension bridges – Unstiffened cables and cables with three hinged stiffening girders – Influence lines for three hinged stiffening girders. Introduction to analysis of space trusses using method of tension coefficients – Beams curved in plan.

UNIT V PLASTIC ANALYSIS 9

Statically indeterminate structures – Beams in pure bending – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism. Static and kinematic methods – Upper and lower bound theorems - Plastic analysis of indeterminate beams and frames.

TOTAL: 45 PERIODS

TEXT BOOKS
1. Bhavikatti, S S, Structural Analysis Vol.1 and 2, Vikas Publishing House Pvt Ltd., New Delhi-4, 2003.
2. B.C.Punmia, Ashok Kumar Jain & Arun Kumar Jain, Theory of structures – Laxmi Publications, New Delhi, 2004.
3. Vaidyanathan, R and Perumal, P, Structural Analysis Vol.1 and 2 Laxmi Publications, New Delhi, 2004

REFERENCES
1. Jain A.K. and Arya A.S., Structural Analysis, Vol.II, Nemchand Publishers, Roorkee, 1996
2. Ashok K.Jain, "Advanced Structural Analysis", Nem Chand & Bros, 1996
3. Reddy C.S., "Basic Structural Analysis". Tata McGraw Hill Pub. Ltd., 2002.
4. Harry H West, "Fundamentals of Structural Analysis " John Wiley Inc., 2002
5. Timoshenko S.P, "Theory of Structures", McGraw Hill Publishing Intl Ltd, 1965

PTCE 2253   APPLIED HYDRAULICS ENGINEERING   L T P C
                                                           3 0 0 3

OBJECTIVE:
- To introduce the students to various hydraulic engineering problems like open channel flows and hydraulic machines. At the completion of the course, the student should be able to relate the theory and practice of problems in hydraulic engineering.

UNIT I   OPEN CHANNEL FLOW   9
Steady uniform flow - Best hydraulic sections for uniform flow - Specific energy and specific force.

UNIT II   STEADY GRADUALLY VARIED FLOWS   9
Dynamic equation - Water surface flow profile classifications - Profile determination by graphical method, direct step method and standard step methods.

UNIT III   RAPIDLY VARIED FLOWS   9
Hydraulic jumps - Types - Energy dissipation - Surges and surge through channel transitions.

UNIT IV   TURBO MACHINES   9

Turbines – Classification - Reaction turbines – Francis turbine, Radial flow turbines, draft tube and cavitation - Propeller and Kaplan turbines - Impulse turbines - Performance of turbines - Similarity laws; Centrifugal pumps - Minimum speed to start the pump – NPSH - Cavitation in pumps - Operating characteristics - Multistage pumps.

UNIT V   POSITIVE DISPLACEMENT PUMPS   9
Reciprocating pumps - Negative slip - Flow separation conditions - Air vessels, indicator diagrams and its variations - Savings in work done - Rotary pumps.

                                                           TOTAL: 45 PERIODS
TEXT BOOKS
1. Subramanya K., Flow in open channels. Tata McGraw Hill, New Delhi 1994.
2. Jain. A.K., Fluid Mechanics. Khanna Publishers, Delhi. 1996.

REFERENCES
1. Ven Te Chow, Open Channel Hydraulics, McGraw Hill, New York, 1959.
2. Mays L. W., Water Resources Engineering. John Wiley and Sons (WSE), New York, 2004.
3. Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics, Standard Book House, New Delhi, 1995
4. Srivastava R., Flow through open channels, Oxford Univ.Press, New Delhi, 2008.

PTCE 2405   RAILWAYS AND AIRPORTS ENGINEERING   L T P C
                                                               3 0 0 3
OBJECTIVE:
- To introduce the students about the various types of transport like Railways and airways, planning and design principles of construction of railway track and airport terminals will be covered with an exposure on standards

UNIT I   RAILWAY PLANNING AND CONSTRUCTION   9
Route alignment surveys, modern methods – Elements of permanent way – Rails, sleepers, ballast, rail fixtures and fastenings, coning of wheels, creep in rails, defects in rails – Geometric design of railway track, gradient, super elevation, widening of guage on curves

UNIT II   RAILWAY STATION YARDS AND OPERATIONS   9
Planning and development of railway station yards, –Turnouts, points and crossings – Signalling - Interlocking, track circuiting – Modern developments in railways, urban railways, underground and tube railways–Basic planning for MRTS and Suburban railways–Electric traction

UNIT III   RAILWAY CONSTRUCTION AND MAINTENANCE   9
Earthwork – Stabilization of track on poor soil- Tunneling - Methods, drainage and ventilation – Construction and maintenance of tracks – uniguage – Maintenance of rolling stocks and signals

UNIT IV   AIRPORT PLANNING   9
Airport site selection – Components of airports- Forecasting in aviation- Airport obstructions – Zoning laws - Regional planning - Airport architecture - Airport lighting - Air traffic control aids

UNIT V   AIRPORT DESIGN   9
Runway orientation – Basic runway length – Corrections to basic runway length – geometric design of runways – Layout of taxiway and terminal area- airport pavement design (flexible pavement only).

                                                    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, Nemachand and Brothers, Roorkee, 1994

REFERENCES
1. Vazirani.V.N. and Chandola.S.P., Transportation Engineering-Vol.1, Khanna Technical Publications, New Delhi 1991
2. Shahini.P., Airport Technique, New Delhi
3. Priyani.V.B., Highway and Airport Engineering, Charotar Book Stall, 1994
4. Rangwala.P.S, Railway Engineering, Charotar Publishing House, 1995
5. Rangwala.P.S, Airport Engineering, Charotar Publishing House, 1996
6. Agarwal.M.M., Indian Railway Track, New Delhi.

PTCE 2353   DESIGN OF REINFORCED CEMENT CONCRETE AND
MASONRY STRUCTURES   L T P C
**   3 0 0 3**

OBJECTIVE:
 * To introduce the various philosophies of R.C. design and to study in detail the limit state design of structural elements such as beams, columns and footings

UNIT I   DESIGN CONCEPTS AND ELASTIC DESIGN OF BEAMS   10
Concept of elastic method, ultimate load method and limit state method – Advantages of Limit State method over other methods – Limit State philosophy as detailed in current IS Code. Design of rectangular beam section by elastic method.

UNIT II   LIMIT STATE DESIGN OF BEAMS   10
Design of singly and doubly reinforced rectangular and flanged beams – use of design aids for flexure – Behaviour of R.C. beams in shear and torsion – Shear and torsional reinforcement – Limit State design of R.C. members for combined bending, shear and torsion – Use of design aids. Design requirement for bond and anchorage as per IS code. Serviceability requirements.

UNIT III   LIMIT STATE DESIGN OF SLABS   10
Behaviour of one way and two way slabs — design of one way simply supported, cantilever and continuous slabs. Design of two-way slabs for various edge conditions. Types of staircases - design of dog-legged staircase.

UNIT IV   LIMIT STATE DESIGN OF COLUMNS AND FOOTING   10
Types of columns – design of short columns for axial load, combined axial load with uniaxial and biaxial bending - use of design aids. Design of footing for masonry and reinforced walls – design of axially and eccentrically loaded square and rectangular footings – design of combined rectangular footings for two columns only

UNIT V   MASONRY MEMBERS   5
Design of masonry walls, pillars and footings as per NBC and IS Codes.

**   TOTAL: 45 PERIODS**
TEXT BOOKS
1. Sinha, S.N. Reinforced Concrete Design – Tata McGraw Hill Publishing Company Ltd. 1996
2. Varghese, P.C., Limit State Design of Reinforced Concrete – Prentice Hall of India Pvt. Ltd. 2002
3. Unnikrishna Pillai and Devdass Menon - Reinforced Concrete Design – Tata McGraw Hill Publishing Company Ltd. 2002

REFERENCES

1. Purushothaman, P. Reinforced Concrete Structural Elements – Tata McGraw Hill Publishing Co. Ltd. 1992

2. Krishna Raju N., Design of Reinforced Concrete Structures, CBS Publishers and Distributors, Delhi 1995

PTCE 2354   WASTE WATER ENGINEERING   L T P C
                                                               3 0 0 3

OBJECTIVE:
  • Principles and design of Sewage Collection, Conveyance, treatment and disposal system will be covered. Relevant GIS codes and Government of India manual will be referred.

UNIT I   PLANNING FOR SEWERAGE SYSTEMS   9
Sources of wastewater generation – Effects – Estimation of sanitary sewage flow – Estimation of storm runoff – Factors affecting Characteristics and composition of sewage and their significance – Effluent standards – Legislation requirements.

UNIT II   SEWER NETWORK DESIGN   9
Sewerage – Hydraulics of flow in sewers – Objectives – Design period - Design of sanitary and storm sewers – Small bore systems - Computer applications – Laying, joining & testing of sewers – appurtenances – Pumps – selection of pumps and pipe Drainage -. Plumbing System for Buildings – One pipe and two-pipe systems.

UNIT III   PRIMARY TREATMENT OF SEWAGE   9
Objective – Unit Operation and Processes – Selection of treatment processes – Onsite sanitation - Septic tank, Grey water harvesting – Primary treatment – Principles, functions design and drawing of screen, grit chambers and primary sedimentation tanks – Construction, Operation and Maintenance aspects.

UNIT IV   SECONDARY TREATMENT OF SEWAGE   9
Objective – Selection of Treatment Methods – Principles, Functions, Design and Drawing of Units - Activated Sludge Process and Trickling filter, other treatment methods – Oxidation ditches, UASB – Waste Stabilization Ponds – Reclamation and Reuse of sewage - Recent Advances in Sewage Treatment – Construction and Operation & Maintenance aspects – Layout and Hydraulic profile of treatment plants.

UNIT V   DISPOSAL OF SEWAGE AND SLUDGE   9
Standards for Disposal - Methods – dilution – Self purification of surface water bodies – Oxygen sag curve – Land disposal – Sewage farming – Deep well injection – Soil dispersion system - Sludge characterization – Thickening – Sludge digestion – Biogas recovery – Sludge Conditioning and Dewatering – disposal – Advances in Sludge Treatment and disposal.

                                                      TOTAL: 45 PERIODS

TEXT BOOKS
1. Garg, S.K., Environmental Engineering Vol. II, Khanna Publishers, New Delhi, 2003.
2. Punmia, B.C., Jain, A.K., and Jain.A., Environmental Engineering, Vol.II, Lakshmi Publications, Newsletter, 2005.

REFERENCES
1. Manual on Sewerage and Sewage Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1997.
2. Metcalf and Eddy - Wastewater Engineering – Treatment and Reuse, Tata Mc.Graw-Hill Company, New Delhi, 2003.

PTCE 2303   **FOUNDATION ENGINEERING**   **L T P C**
                                                     3 0 0 3

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 FOUNDATION   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.

                                                     TOTAL: 45 PERIODS

TEXT BOOKS

1. Murthy, V.N.S, "Textbook of Soil Mechanics and Foundation Engineering", CBS Publishers and Distributors, New Delhi, 2007.
2. Gopal Ranjan and Rao, A.S.R. "Basic and Applied Soil Mechanics", Wiley Eastern Ltd. New Delhi (India), 2000.
3. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2002.
4. Varghese, P.C., Foundation Engineering, Prentice Hall of India (P) Ltd, New Delhi, 2005.

REFERENCES

1. Das, B.M. "Principles of Foundation Engineering" (Fifth edition), Thomson Books, 2003.
2. wamisaran, "Analysis and Design of Structures – Limit state Design", Oxford IBH Publishing Co.Pvt.Ltd., New Delhi, 2005.
3. Kaniraj, S.R. "Design aids in Soil Mechanics and Foundation Engineering", Tata McGraw Hill publishing company Ltd., New Delhi, 2002.
4. Bowles, J.E. "Foundation analysis and design", McGraw Hill, 1994.
5. Punmia, B.C. Soil Mechanics and Foundations", Laxmi Publications Pvt.Ltd. New Delhi, 1995.
6. Venkatramaiah, C. "Geotechnical Engineering", New Age International Publishers, New Delhi, 2007 (Reprint).

PTCE 2356   **COMPUTER AIDED STRUCTURAL**

ENGINEERING DRAWING (PRACTICAL)   **L T P C**

0 0 4 2

OBJECTIVES:

- To develop the ability to design steel and concrete structural components and transfer the design into drawings as per IS Codes

LIST OF EXPERIMENTS

1. Design and Drawing of R.C.C. cantilever and counter fort type retaining walls with reinforcement details.
2. Design and Detailing of R.C slab and R.C. Tee Beam Bridge deck and reinforcement details
3. Design of circular, rectangular and intz type water tank – Reinforcement details Design of R.C.C. circular and rectangular water tanks – ground – overhead - Reinforcement detail.
4. Design of plate girder – Twin girder deck type railway bridge – Through type and deck type Highway bridges – Truss girder bridges – Detailed drawing – riveted and welded connections. Basic Structural Steel Connection Details – Design of Plate Girder – Detailed. Drawing – Design and Detailing of Steel Roof Truss.
5. Design of rectangular and hemispherical bottomed steel tank – Staging riveted joints - Detailed Drawing.
6. Demonstration using modern soft ware

TOTAL: 60 PERIODS

TEXT BOOKS
1. Krishnaraju, "Structural Design & Drawing" (Concrete & Steel – Volume II and III) –CBS Publishers, 2004.
2. B.C. Punmia, Ashok Kumar Jain & Arun Kumar Jain, "Comprehensive Design of Steel Structures" Laxmi Publications Pvt. Ltd., 2003

REFERENCES
1. Krishnamurthy, D. Structural Design and Drawing Vol.II, CBS, Publishers & Distributors, Delhi, 1992
2. Krishnamurthy, D. Structural Design and Drawing Vol.III (Steel Structures), CBS, Publishers & Distributors, Delhi, 1992.

PTCE 2404   ESTIMATION, COSTING AND VALUATION ENGINEERING

L T P C
3 0 0 3

OBJECTIVE:
- To offer knowledge in estimation, tender practices, contract procedures, and valuation. The student will be able to prepare estimates, call for tenders and execute works.

UNIT I   QUANTITY ESTIMATION   9
Philosophy – Purpose – Methods of estimation – Types of estimates – Approximate estimates –Detailed estimate – Estimation of quantities for buildings, roads, canals and hydraulic structures using computer softwares.

UNIT II   RATE ANALYSIS AND COSTING   9
Standard Data – Observed Data – Schedule of rates – Market rates – Assessment of Man Hours and Machineries for common civil works – Rate Analysis – Cost Estimates using Computer softwares

UNIT III   SPECIFICATIONS AND TENDERS   9
Specifications – Detailed and general specifications – Constructions – Sources – Types of specifications – TTT Act 2000 – Tender notices – types – tender procedures – Drafting model tenders , E-tendering-Digital signature certificates- Encrypting - Decrypting – Reverse auctions.

UNIT IV   CONTRACTS   9
Contract – Types of contracts – Formation of contract – Contract conditions – Contract for labour, material, design, construction – Drafting of contract documents based on IBRD / MORTH Standard bidding documents – Construction contracts – Contract problems – Arbitration and legal requirements.

UNIT V   VALUATION   9
Definitions – Various types of valuations – Valuation methods – Valuation of land – Buildings – Valuation of plant and machineries.

TOTAL: 45 PERIODS

TEXT BOOKS
1. B.S.Patil, 'Civil Engineering Contracts and Estimates', University Press, 2006
2. D.N. Banerjee, 'Principles and Practices of Valuation', V Edition, Estern Law House, 1998

REFERENCES

1. Hand Book of Consolidated Data – 8/2000, Vol.1, TNPWD
2. Tamil Nadu Transparencies in Tenders Act, 1998
3. Arbitration and Conciliation Act, 1996
4. Standard Bid Evaluation Form, Procurement of Good or Works, The World Bank, April 1996
5. Standard Data Book for Analysis and Rates, IRC, New Delhi, 2003.

PTCE 2352 **IRRIGATION ENGINEERING** **L T P C**
3 0 0 3

OBJECTIVE:
- To introduce the student to the concept of soil – Plant characteristics and their water requirements. At the completion of the course the students should be able to understand the necessity of planning an irrigation system to provide water at the right quantity and at right time.

UNIT I   IRRIGATION PRINCIPLES   10
Need for irrigation – Advantages and ill effects – Development of irrigation – National Water Policy – Tamil Nadu scenario - Physical properties of soil that influence soil moisture characteristics – Concept of soil water potential and its components: Gravitational, Pressure and Osmotic- Retention of water in soils and concept of plant available water – Movement of water into and within the soils – Measurement of soil moisture content and the matric tension with which it its held

UNIT II   IRRIGATION WATER REQUIREMENT AND CROPS   8
Soil- Water-Plant relationship - Water as a constituent of plant – Soil-Plant-Atmosphere continuum – Terminology in plant – Water relationships (Evapotranspiration, consumptive use and crop factor) – Critical stages of crop growth for water requirement – Analysis of crop water demand: basic concepts and estimation

UNIT III   IRRIGATION SYSTEM COMPONENTS   11
Components of irrigation network; Diversion headworks, Canal regulators, Canal drop, canal cross drainage works, Canal outlets, - Functions of the above components – Canal lining - Supply of irrigation water: Duty, Delta and Base period – Concepts of Kennedy's and Lacey's formulae

UNIT IV   FIELD TECHNIQUES   8
Field Measurements, Land leveling and drainage – Irrigation methods: relative merits and limitations – Evaluation of irrigation methods –Irrigation water quality - Irrigablity of soils and the irrigation related degradation of soil resource (such as water logging, salinity and sodicity)

UNIT V   IRRIGATION WATER MANAGEMENT   8
Need for interdisciplinary approach – Irrigation beneficiaries - Irrigation Efficiency-Irrigation scheduling concepts – methods of irrigation scheduling – On farm development works - Participatory approach: farmer's organization and turn over – Water Users Association – Economical aspects of irrigation

TOTAL: 45 PERIODS

TEXT BOOKS
1. Micheal, A. M. Irrigation – Theory and Practice, Vikas Publishing House, New Selhi, 1990.
2. Sharma, R. K. Irrigation Engineering and Hydraulic Structures, Oxford and IBH Publishing Company, New Delhi, 1994.
3. Dilip Kumar Mujumdar, Irrigation Water Management – Principals and Practice, Prentice Hall of India, New Delhi, 2000.
4. Sathyanarayana Murthy, Water Resources: Engineering Principles and Practices, New Age Publishers, New Delhi, 1997.
5. Wynn R. Walker and Gaylord V. Skogerboe, Surface Irrigation: Theory and Practice, Prentice Hall, Englewood, New Jersey, 1987.

PTCE 2355   FUNDAMENTALS OF REMOTE SENSING AND GIS   L T 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 software – 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 Information System. Second edn. BS Publications, Hyderabad.
3. 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.
4. Peter A.Burrough, Rachael A.McDonnell (2000). Principles of GIS. Oxford University Press.
5. Ian Heywood (2000). An Introduction to GIS. Pearson Education Asia.

PTCE 2401   PRINCIPLES OF MANAGEMENT   L T P C
**   3 0 0 3**

OBJECTIVE:
- To introduce the basic concepts of management needed for a Civil Engineer

UNIT I   BASIC CONCEPTS IN MANAGEMENT   9
Types of business operations -Sole proprietorship – Partnership – Company – Public and private sector enterprises / Joint ventures, collaborations.
Functions of Management -Principles of management – Functions of management – Functions of a manager.
Production Management -Planning – scheduling – procurement – Inventory control – management tools – L.P. – PERT, CPM, etc.

UNIT II   INTRODUCTION TO MARKETING AND FINANCIAL
**   MANAGEMENT   9**
Market – Marketing, Segmentation, Positioning, Marketing Research, Market Planning, Scope of financial management – Cost accounting Vs Financial accounting, Appraisal of projects, Investment decisions – concept of pay back.

UNIT III   MATERIALS AND EQUIPMENT MANAGEMENT   9

Planning – Identification, Procurement, Schedule and Cost control – systems approach in resource management – ABC analysis, VED analysis, FSN analysis, vendor rating evaluation, buying versus leasing of equipment

UNIT IV   HUMAN RESOURCE MANAGEMENT   9

Scope and objectives of HRM – Man power policy and planning – Recruitment and selection – Training performance appraisal – Wage policy and compensation systems – Company union relationship and collective bargaining – Accidents – Absenteeism and turn over – Grievances / conflicts – Identification and resolution.

UNIT V   INTRODUCTION TO COMPUTER APPLICATION
(IN CONSTRUCTION MANAGEMENT)   9

Project identification-formulation-Preparation of detailed project report (DPR)-Planning – Scheduling and Resource analysis - Recording and operations- Project accounting, costing and finance – usage of project management software-

TOTAL: 45 PERIODS

TEXT BOOKS
1. Konni, Donnel C.O., and Weighnrich, H., "Management" Eighth Edition, McGraw Hill International Book Company, New York, 1997.
2. Philip Kotler, "Marketing Management", Prentice-Hall of India, New Delhi, 1998.

REFERENCES
1. Momoria, "Personnel Management", Himalaya Publishing Co., New Delhi, 1992.
2. Sharma, J.L., "Construction Management and Accounts", Sathya Prakashan, New Delhi, 1994.
3. Srinath, L.S., "An Introduction to Project Management", Tata McGraw Hill Publications, New Delhi, 1995.

PTCE 2402 STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING
                                            L T P C
                                            3 0 0 3

OBJECTIVE:
- To provide a basic understanding of dynamic loading. Study the effect of earthquake loading on the behaviour of structures. Understand the codal provisions to design the structures as earthquake resistant**.**

UNIT I   SINGLE DEGREE OF FREEDOM SYSTEMS   9

Formulation of equation of motion, Free and forced vibrations, Damping, Types of Damping- Damped and undamped vibrations, Response to dynamic loading.

UNIT II   MODAL ANALYSIS   9

Free and forced vibration of undamped and damped MDOF systems. Equation of motions, Evaluation of natural frequencies and modes, Eigenvalues and Eigenvectors

UNIT III   INTRODUCTION TO EARTHQUAKE ENGINEERING   9
Elements of Engineering Seismology, Characteristics of Earthquake Engineering, Earthquake History, Indian Seismicity.

UNIT IV   BEHAVIOUR OF STRUCTURES AND SOIL   9
Performance of structures under past earthquakes, Lessons learnt from past earthquakes– soil liquefaction - Soil – Structure- Interaction (SSI) effects.

UNIT V   EARTHQUAKE RESISTANT DESIGN   9
Concept of Earthquake Resistant Design, Provisions of Seismic Code IS 1893 (Part I), Response Spectrum, Design Spectrum, Design of Buildings, Reinforcement Detailing, Provisions of IS 13920.

TOTAL: 45 PERIODS

TEXT BOOKS
1. Agarwal and Shrikhande,"Earthquake Resistant Design of Structures", Prentice Hall of India, 2007
2. Clough R.W, and Penzien J , Dynamics of Structures, Second Edition, Mc Graw – Hill International Edition, 1993

REFERENCES
1. Mario Paz, Structural Dynamics – Theory and Computations, Third Edition, CBS publishers, 1990.
2. Jaikrishna, A.R. Chandrasekaran and Brijesh Chandra, "Elements of Earthquake Engineering", South Asia Publishers, New Delhi.
3. Minoru Wakabayashi, "Design of Earthquake Resistant Buildings", Mc Graw – Hill Book Company, New York, 1986
4. Humar J L "Dynamics of Structures", Prentice Hall, 1990.
5. Anil K Chopra, "Dynamics of structures – Theory and applications to Earthquake Engineering", Prentice Hall Inc., 2001.
6. C V R Moorthy, "Earthquake Tips", NICEE, IIT Kanpur, 2004

PTCE 2451   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   **BRIDGE STRUCTURES**   **L T P C**
                                                        3 0 0 3

OBJECTIVE:
- To impart exposure on various aspects of structural design of common types of steel and concrete bridges.

UNIT I   HIGHWAY STEEL BRIDGES   8
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 – Design of pratt type truss girder highway bridges – Design of top chord, bottom chord, web members – Effect of repeated loading.

UNIT II   RAILWAY STEEL BRIDGES   7
Design of plate girder railway bridges for railway loading – Wind effects – Design of web and flange plates – Vertical and horizontal stiffeners – Web and flange splicing.

UNIT III   REINFORCED CONCRETE BRIDGES   15
Types of Bridges - Design of solid slab bridges for IRC loading - Design of kerb – Design of tee beam bridges – Design of panel and cantilever for IRC loading – Design of tee beams - Courbon's theory – Pigeaud's curves – Design of balanced cantilever bridges – Deck slab – Main girder – Design of cantilever – Design of articulation

UNIT IV   AQUEDUCTS AND BOX CULVERTS   6
Design of Aqueducts and Syphon Aqueducts – Design of Box Culverts.

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 1995
2. Ponnuswamy S., Bridge Engineering, Tata McGraw Hill, New Delhi, 1996.
3. Phatak D.R., Bridge Engineering, Satya Prakashan, New Delhi, 1990.

REFERENCE
1. Dr.B.C.Punmia, Ashok Kumar, Jain and Arun Kumar Jain, R.C.C. Designs, Laxmi Publications (P) Ltd. New Delhi, 1998

PTCE 2022   **PREFABRICATED STRUCTURES**   **L T P C**
                                                            3 0 0 3

OBJECTIVE:
- To learn the design prefabricated structures

UNIT I   INTRODUCTION   10
Need for prefabrication - Principles - Materials - Modular co-ordination – Standardization – Systems Production – Transportation – Erection.

UNIT II   PREFABRICATED COMPONENTS   10
Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs Wall panels – Columns – Shear walls.

UNIT III   DESIGN PRINCIPLES   10
Disuniting of structures – Design of cross section based on efficiency of material used - Problems in design because of joint flexibility – Allowance for joint deformation.

UNIT IV   JOINTS IN STRUCTURAL MEMBERS   8
Joints for different structural connections – Dimensions and detailing – Design of expansion joints- Jointing Materials.

UNIT V   DESIGN FOR ABNORMAL LOADS   7
Progressive collapse – Codal 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. Gerostiza C.Z., Hendrikson C. and Rehat D.R., Knowledge Based Process Planning for Construction and Manufacturing, Academic Press Inc., 1989
2. Koncz T., Manual of Precast Concrete Construction, Vols. I, II and III, Bauverlag, GMBH, 1971.
3. Structural Design Manual, Precast Concrete Connection Details, Society for the Studies in the Use of Precast Concrete, Netherland Betor Verlag, 1978.
4. M.Levitt, "Precast Concrete Material, Manufacture, Properties and Usage" Applied Science Publishers Ltd., 1982.

REFERENCES
1. Building Materials and Components, CBRI, , India, 1990.
2. Glover C.W, "Structural Precast Concrete", Asia Publishing House, 1965

PTCE 2023   COMPUTER AIDED DESIGN OF STRUCTURES   L T P C
                                                        3 0 0 3

OBJECTIVE:
- The overall idea of implementing a computer aided design with advantages and demerits. The software techniques in finite element analysis and the applications and optimize the structural components.

UNIT I   INTRODUCTION   9
Fundamentals of CAD - Software requirements – Hardware components in CAD system – Design process - Applications and benefits.

UNIT II   COMPUTER GRAPHICS   9
Graphic Software – Graphic primitives - Transformations - 2 Dimensional and 3Dimensional transformations – Concatenation - Wire frame modeling and solid modeling - Graphic standards - Drafting packages – Auto CAD.

UNIT III   STRUCTURAL ANALYSIS   9
Fundamentals of finite element analysis - Concepts of finite elements - Principles of structural analysis – Stiffness matrix formulation – Variational Method – Weighted residual method – Problems – Conditions of convergence of functions – Analysis packages and applications.

UNIT IV   DESIGN AND OPTIMIZATION   9
Principles of design of steel and RC structures - Beams and Columns - Applications to simple design problems - Optimization techniques - Algorithms - Linear programming.

UNIT V   EXPERT SYSTEMS   9
Introduction to artificial intelligence - Knowledge based expert systems – Rules and decision tables - Inference mechanisms - simple applications

                                                    TOTAL: 45 PERIODS
TEXT BOOKS
1. Groover M.P. and Zimmers E.W.Jr., "CAD / CAM, Computer Aided Design and Manufacturing", Prentice Hall of India Ltd, New Delhi, 1984.
2. Krishnamoorthy C.S.Rajeev, S. "Computer Aided Design", Narosa Publishing House, New Delhi,1990.

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

PTCE 2024   MAINTENANCE AND REHABILITATION OF STRUCTURES

L T P C
3 0 0 3

OBJECTIVE:
- To get the knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.

UNIT I   MAINTENANCE AND REPAIR STRATEGIES   8
Maintenance, repair and rehabilitation, Facets of Maintenance, importance of Maintenance various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

UNIT II   SERVICEABILITY AND DURABILITY OF CONCRETE   12
Quality assurance for concrete construction concrete properties- strength, permeability, thermal properties and cracking. - Effects due to climate, temperature, chemicals, corrosion - design and construction errors - Effects of cover thickness and cracking

UNIT III   MATERIALS AND TECHNIQUES FOR REPAIR   15
Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, ferro cement, Fibre reinforced concrete. Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic protection.

UNIT IV   REPAIRS, REHABILITATION AND RETROFITTING OF
STRUCTURES   6
Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure.

UNIT V   DEMOLITION TECHNIQUES   4
Engineered demolition techniques for dilapidated structures - case studies

TOTAL: 45 PERIODS

TEXT BOOKS
1. Denison Campbell, Allen and Harold Roper, Concrete Structures, Materials, Maintenance and Repair, Longman Scientific and Technical UK, 1991.
2. R.T.Allen and S.C.Edwards, Repair of Concrete Structures, Blakie and Sons, UK, 1987

REFERENCES
1. M.S.Shetty, Concrete Technology - Theory and Practice, S.Chand and Company, New Delhi, 1992.
2. Santhakumar, A.R., Training Course notes on Damage Assessment and repair in Low Cost Housing , "RHDC-NBO" Anna University, July 1992.
3. Raikar, R.N., Learning from failures - Deficiencies in Design, Construction and Service - R&D Centre (SDCPL), Raikar Bhavan, Bombay, 1987.
4. N.Palaniappan, Estate Management, Anna Institute of Mgmnt., Chennai, 1992
5. Lakshmipathy, M. Senthil.R, Lecture Notes of "Workshop on Repairs and Rehabilitation of Structures", October 1999.

PTCE 2025   **STORAGE STRUCTURES**   **L T P C**
                                                                3 0 0 3

OBJECTIVE:
- To learn the design of water tank and other storage elements.

UNIT I   STEEL WATER TANKS   15
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.

UNIT II   CONCRETE WATER TANKS   15
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 – Design of rectangular tanks –
Approximate method and IS methods – Design of under ground tanks – Design of
base slab and side wall – Check for uplift.

UNIT III   STEEL BUNKERS AND SILOS   5
Design of Square bunker – Jansen's and Airy's theories – IS codal provisions –
Design of side plates – Stiffeners – Hopper – Longitudinal beams – Design of
cylindrical silo – Side plates – Ring girder – Stiffeners.

UNIT IV   CONCRETE BUNKERS AND SILOS   5
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   FOUNDATION   5
Design at various types of foundation like isolated, combined and Raft foundation for
a Water tanks, Bunkers and Silo's.

                                                        TOTAL: 45 PERIODS

TEXT BOOKS
1. Rajagopalan K., Storage structures, Tata McGraw Hill, New Delhi, 1989.
2. Krishna Raju N., Advanced Reinforced Concrete Design, CBS Publishers and
   Distributors, New Delhi, 1988.

PTCE 2026   DESIGN OF PLATE AND SHELL STRUCTURES

	L	T	P	C
	3	0	0	3

OBJECTIVE:
* To learn the design of plate and shell structures

UNIT I   THIN PLATES WITH SMALL DEFLECTION   10
Laterally loaded thin plates - Governing differential equation, various boundary conditions.

UNIT II   RECTANGULAR PLATES   10
Simply supported rectangular plates - Navier solution and Levy's method – Loading.

UNIT III   THIN SHELLS   5
Classification of shells - Types of shells - Structural action.

UNIT IV   ANALYSIS OF SHELLS   10
Shells of revolution – Spherical dome, Conical shell and ellipsoid of revolution – Shells of translation – Cylindrical shell and Hyperbolic parabolid.

UNIT V   DESIGN OF SHELLS   10
Spherical dome, Conical shell and cylindrical shell.

TOTAL: 45 PERIODS

TEXT BOOKS
1. R. Szilard, Theory and Analysis of Plates, Prentice Hall Inc., 1995
2. S.Timoshenko and S.W.Krieger, Theory of Plates and Shells, McGraw Hill, 1990.
3. G.S.Ramasamy, Design and Construction of Concrete Shells Roofs, CBS Publishers and Distributors, New Delhi 1996

REFERENCES
1. Billington D.P. Thin Shell Concrete Structures, McGraw Hill,1995
2. Chatterjee B.K. Theory and design of Concrete Shells, Oxford and IBH Publishing Co., New Delhi 1998.

PTCE 2027   **PRESTRESSED CONCRETE STRUCTURES**   **L   T   P   C**
                                                              3   0   0   3

OBJECTIVE:

- To understand the behaviour and performance of prestressed concrete structures. Compare the behaviour of prestressed concrete members with that of the normal reinforced concrete structures. Understand the performance of composite members. Finally to learn the design of prestressed concrete structures.

UNIT I   FUNDAMENTAL PRINCIPLES   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

UNIT II   BEHAVIOUR   9
Losses of prestress – factors affecting the losses of prestress. Deflections of prestressed concrete members - Factors influencing deflections –Effect on tendon profile on deflections. Short term and long term – deflections

UNIT III   DESIGN   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 IV   COMPOSITE CONSTRUCTION   9
Analysis for stresses – Estimation of deflections – Flexural and shear strength of composite members – Differential Shrinkage – Shrinkage induced stresses.

UNIT V   SPECIAL STRUCTURES   9
Prestressed concrete tanks, poles, sleepers. Prestressed concrete bridges - General aspects – pretensioned prestressed bridge decks – Post tensioned prestressed bridge decks – Advantages over R.C. bridges – Principles of design only

TOTAL: 45 PERIODS

TEXT BOOKS
1. Krishna Raju N., Prestressed concrete, Tata McGraw Hill Company, New Delhi 1998
2. N Rajagopal, Prestressed concrete, Second Edition, Narosa Publications, New Delhi, 2007

REFERENCES
1. Mallic S.K. and Gupta A.P., Prestressed concrete, Oxford and IBH publishing Co.Pvt. Ltd. 1997.
2. Ramaswamy G.S., Modern prestressed concrete design, Arnold Heinimen, New Delhi, 1990
3. Lin T.Y. Design of prestressed concrete structures, Asia Publishing House, Bombay 1995.
4. David A.Sheppard, William R. and Philips, Plant Cast precast and prestressed concrete – A design guide, McGraw Hill, New Delhi 1992.

PTCE 2028   **INDUSTRIAL STRUCTURES**

                              L T P C
                              3 0 0 3

OBJECTIVE:
- To learn the layout design and functional aspects and designing the various industrial elements.

UNIT I   PLANNING   9
Classification of industries and industrial structures – General requirements of various industries – Planning and layout of buildings and components.

UNIT II   FUNCTIONAL REQUIREMENTS   9
Lighting – Ventilation Lighting – Illumination levels – Characteristics of Good lighting – Principles of day lighting design – Artificial lighting – Ventilation – Natural and Mechanical Ventilation – Evaporate cooling design – Measurement – Contaminant control – Installation and Operation - Acoustics – Fire safety – Guidelines from factories act.

UNIT III   DESIGN OF STEEL STRUCTURES   9
Industrial roofs – Crane girders – Mills buildings – Chimney.

UNIT IV   DESIGN OF R.C. STRUCTURES   9
Silos and bunkers – Principles of Design of Chimney

UNIT V   PREFABRICATION   9
Principles of prefabrication – Pretressed precast roof trusses

                                        TOTAL: 45 PERIODS

TEXT BOOKS
1. Henn W., Buildings for industry, vols. I and II, London Hill Books, 1965.
2. "Course Notes on Modern Developments in the Design and Construction of Industrial Structures", Structural Engineering Research Centre, Madras, 1982.

REFERENCES
1. Gray W.S., "Reinforced Concrete Water Towers, Banks, Silos and bunkers" Concrete Publications Ltd., Ed.1, 1957.
2. Taylor C.P., Turter.L., "Reinforced Concrete Chimneys", Concrete Publications Ltd., Ed.2, 1940.
3. Manohar.S.N., "Tall Chimneys; Design and Construction", Tata McGraw Hill, Ed.1, 1985.
4. N.Krishnaraju, "Advanced Reinforced Concrete Design,CBS Publishers and Distributors, New Delhi, 1986.
5. Ramchandra, "Design of Steel Structures', Vol.2, Standard Book House, Delhi, 1984.

PTCE 2029 **TALL STRUCTURES**

L T P C
3 0 0 3

OBJECTIVE:
- To provide an insight to the design of tall buildings. To enlighten the students on modern techniques available for the analysis of tall buildings.

UNIT I DESIGN CRITERIA 8
Design Philosophy, Materials – Modern concepts – High Performance Concrete, Fibre Reinforced Concrete, Light weight concrete, Self Compacting Concrete.

UNIT II LOADING 9
Gravity Loading – Dead load, Live load, Impact load, Construction load, Sequential loading. Wind Loading – Static and Dynamic Approach, Analytical method, Wind Tunnel Experimental methods. Earthquake Loading – Equivalent lateral Load analysis, Response Spectrum Method, Combination of Loads,

UNIT III BEHAVIOUR OF STRUCTURAL SYSTEMS 9
Factors affecting the growth, height and structural form, Behaviour of Braced frames, Rigid Frames, in filled frames, Shear walls, Coupled Shear walls, Wall – Frames, Tubular, Outrigger braced, Hybrid systems.

UNIT IV ANALYSIS 10
Modeling for approximate analysis, Accurate analysis and reduction techniques, Analysis of structures as an integral unit, Analysis for member forces, drift and twist. Computerized 3D analysis, Evaluation of frequency of vibration of structures

UNIT V DESIGN OF TALL BUILDINGS 9
Design for differential movement, Creep and Shrinkage effects, Temperature Effects and Fire Resistance.

TOTAL: 45 PERIODS

TEXT BOOKS
1. Bryan Stafford Smith and Alex Coull, " Tall Building Structures ", Analysis and Design, John Wiley and Sons, Inc., 1991.
2. Taranath B.S, "Structural Analysis and Design of Tall Buildings", McGraw Hill, 1988

REFERENCES
1. Coull, A. and Smith Staford, 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. Wolfgang Schuler, "High Rise Building Structures", John Wiley & Sons, New York, 1976.

PTCE 2030   **WIND ENGINEERING**   L   T   P   C
                                                3   0   0   3

OBJECTIVE:
- The course introduces to the undergraduate students, the phenomena, governing equations and the engineering problems associated with wind flow around various structures.

UNIT I   INTRODUCTION TO WIND ENGINEERING   9

Continuity and Navier-Stokes equations, atmospheric pressure and gradient wind, peak and hourly mean wind speeds, wind energy and turbulence, spectral distribution and boundary layer.

UNIT II   AERODYNAMICS OF WIND LOADING   9

Bluff bodies aerodynamics, ideal flow, separation, wake, vortex shedding flow past circular and rectangular objects, Buffeting and ovalling, Galloping and flutter

UNIT III   MODELLING AND ANALYSIS   9

Wind tunnel studies, types of wind tunnels, Modeling requirements, pressure, velocity, turbulence and force measurements and related instrumentation, Wall effects, similarity laws, Aero-elastic models

UNIT IV   WIND ON STRUCTURES   9

Chimneys, tall buildings, towers and bridges, Rigid and flexible structures, Analytical procedures for along wind and across wind forces.

UNIT V   DESIGN OF STRUCTURES UNDER WIND LOADING   9

Applications to design, codal provisions, Design wind velocities, Wind resistant design by Indian Codes and other International Codes of Practice, Case studies.

TOTAL: 45 PERIODS

TEXT BOOK
1. Cook,N.J., The Designer's Guide to Wind Loading of Building Structures, Butter worths, 1989.

REFERENCES
1.. Peter Sachs, Wind Forces in Engineering, Pergamon Press, New York, 1972.
2. Lawson,T.V., Wind Effects on Buildings, Vols. 1 & 2, Applied Science Publishers, London, 1980
3. Simiu.E., and Scanlan,R.H., Wind Effects on Structures: An Introduction to Wind Engineering, John Wiley & Sons
4. Taranath,B.S., Structural Analysis and Design of Tall Buildings, McGraw Hill, 1988.

PTCE 2031   **SMART MATERIALS AND STRUCTURES**   L   T   P   C
                                                            3   0   0   3

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

UNIT I   PROPERTIES OF MATERIALS   9
Piezoelectric Materials , Piezoelectric properties, Actuation of structural components, Shape Memory Alloys, Constitutive modeling of the shape memory effect, vibration control, Embedded actuators, Applications of shape memory alloys.

UNIT II   ER AND MR FLUIDS   9
Electrorheological and magnetorheological fluids, Mechanisms and Properties, Applications of ER and MR fluids, Fiber Optics, Fiber characteristics, Fiber optic strain sensors, Applications of optical fibers

UNIT III   VIBRATION ABSORBERS   9
Parallel damped vibration absorber, Gyroscopic vibration absorber, Active vibration, absorber, Applications, Vibration Characteristics of mistuned systems, Analytical approach

UNIT IV   CONTROL OF STRUCTURES   9
Control modeling of structures, Control strategies and limitations, classification of control systems, Classical control, Modern control, Optimal control and Digital control, Active structures in practice.

UNIT V   BIOMIMETICS   9
Characteristics of natural structures, Biomimetic structural design, Biomimetic sensing, Challenges and opportunities for Biomimetics, Chemical and biochemical sensing in structural assessment, Absorptive chemical sensors, Spectroscopes

                                                    TOTAL: 45 PERIODS

TEXT BOOK
1. Srinivasan,A.V., and Michael McFarland.D., Smart Structures – Analysis and Design, Cambridge University Press, 2001.

REFERENCES

1. Brian Culshaw, Smart Structures and Materials , Artech House, Boston, 1996
2. M.V.Gandhi and B.S.thompson, Smart Materials and Structures , Chapman and Hall 1992
3. Mel. M Schwartz, Encyclopedia of Smart Materials, John Wiley and Sons inc. 2002

PTCE 2032   FINITE ELEMENT TECHNIQUES

L T P C
3 0 0 3

OBJECTIVE:
- The course is designed to provide an insight into the Finite Element Techniques for modeling and analysis of structural systems.

UNIT I   INTRODUCTION   9
Modelling- Continuum and Discrete Domains – Boundary value problem – Approximate Solutions – Variational and Weighted Residual Formulations – Ritz formulation – Introduction to finite domains and finite elements.

UNIT II   ONE DIMENSIONAL PROBLEMS   9
Generalised Coordinates- Interpolation and shape functions – Bar and Truss elements- Equation formulation – Assembly – Introduction of Boundary Conditions – Penalty function approach – Identification with matrix methods.

UNIT III   TWO DIMENSIONAL AND BEAM ELEMENTS   9
Minimum Potential Energy Theorems – Principle of virtual work – Generalised finite element formulation – Beam element – Two dimensional elements – Triangular and Rectangular elements – Axisymmetric elements – Higher order elements.

UNIT IV   ISO PARAMETRIC FORMULATION AND NUMERICAL
                   INTEGRATION   9
Concept of Isoparametric elements – Working with shape functions – Numerical integration in one and two dimensions.

UNIT V   APPLICATIONS   9
Plane stress and plane strain problems – heat transfer problems – Solution techniques, Standard packages and their features.

TOTAL: 45 PERIODS

TEXT BOOKS
1. J.N.Reddy, "An Introduction to Finite Element Method", McGraw-Hill, Intl. Student Edition, 1985.
2. S.S.Bhavikati, "Finite Element Analysis", New Age Intl. Publishers, 2005

REFERENCES
1. Zenkiewicz and Taylor , "The finite element method, Basic formulation and linear problems", Vol.1, 4/e, McGraw-Hill, Book Co.
2. S.S.Rao, "The Finite Element Method in Engineering", Pergaman Press, 1989.
3. C.S.Desai and J.F.Abel, "Introduction to the Finite Element Method", Affiliated East West Press, 1972.
4. Lui G R and Quek S S "The Finite Element Method", MPG Books Ltd, Bodmin, Cornwall, 2003.
5. Chandrupatla T R and Belegundu A D Introduction to Finite Element, Pearson Education (Singapore), Pte. Ltd, Indian Branch Delhi., 2003.
6. Madhujit Mukhopadhyay and Abdul Hammed Sheik, "Matrix and finite element Analysis of Structures", Area Books 2004

PTCE 2033   **GROUND WATER ENGINEERING**

L T P C
3 0 0 3

OBJECTIVES:
- To introduce the student to the Principles of Groundwater governing equations and characteristics of different aquifers.
- At the completion of the course the students should be able to understand the Techniques of development and management of groundwater.

UNIT I   HYDROGEOLOGICAL PARAMETERS   10
Introduction – Water bearing Properties of Rock – Properties of aquifer – Transmissivity and storage coefficient – Problems in Specific yield Darcy's law and permeability – Methods of Estimation – Ground water table fluctuation and its interpretations – Type of aquifers – Groundwater development and Potential in India – GEC norms.

UNIT II   WELL HYDRAULICS   10
Objectives of Groundwater hydraulics – Groundwater equation – steady state flow - Dupuit Forchheimer assumption - Unsteady state flow - Thies method - Jacob method - Image well theory – Partial penetrations of wells.

UNIT III   GROUND WATER MANAGEMENT   8
Need for Management Model – Database for groundwater management – groundwater balance study – Introduction to Mathematical model – Conjunctive use – Collector well and Infiltration gallery.

UNIT IV   WATER QUALITY   8
Ground water chemistry - Origin, movement and quality - Water quality standards – Saline intrusion –Environmental concern.

UNIT V   GROUNDWATER CONSERVATION   9
Artificial recharge techniques – Remediation of Saline intrusion–Ground water management studies – Ground water Pollution and legislation.

TOTAL: 45 PERIODS

TEXT BOOKS
1. Raghunath H.M., Ground Water Hydrology, Wiley Eastern Ltd., Second reprint, New Delhi, 1990.
2. Ramakrishnan S, Ground Water, Tamil Nadu, 1998.
3. Todd D.K., Ground Water Hydrology, John Wiley and Sons, New York, 2000.

PTCE 2034   **WATER RESOURCES SYSTEMS**

                                                    L T P C
                                                    3 0 0 3

OBJECTIVES:
- To introduce the student to the concept of Mathematical approaches for managing the water resources system.
- At the completion of the course the students should be able to apply an appropriate system approach to optimally operate a water resource system.

UNIT I   SYSTEM APPROACH   7
Philosophy of modelling – Goals and Objectives – Basics of system analysis concept – scopes and steps in systems engineering.

UNIT II   PHYSICAL AND SOCIO - ECONOMIC DATA   6
Collection, evaluation and processing – project appraisal – public involvement, master Comprehensive and integrated planning of water resources project.

UNIT III   LINEAR PROGRAMMING   10
Operation research an introduction - Problem Formulation-graphical solution-Simplex method – Sensitivity analysis - simple applications

UNIT IV   DYNAMIC PROGRAMMING   11
Optimality criteria Stage coach problem – Bellman's optimality criteria Problem formulation and Solution - simple applications

UNIT V   SIMULATION   11
Basic principles – Methodology and Philosophy – Model development – input and outputs – Deterministic simulation - simple applications

                                                    TOTAL: 45 PERIODS

TEXT BOOK
1. Vedula, S., and Majumdar, P.P. *Water Resources Systems – Modeling* Techniques and Analysis Tata McGraw Hill 2005.

REFERENCES
1. Chadurvedi M.C., Water resource Systems Planning and Management, Tata McGraw Hill inc., New Delhi,1997
2. Goodman Aluvin s., Principles of water resources Planning, Prentice-Hall, India 1984.
3. Taha H.A., Operation Research, McMillan Publication Co., New York, 1995.
4. Maass A., Husfchimidt M.M., ,Dorfman R., ThomasH A., Marglin S.A and Fair G. M., Design of Water Resources System, Hardward University Press, Cambridge, Mass.,1995.
5. Hall Warren, A., and John A. Dracup., Water Resources System Engineering, Tata   McGraw-Hill Publishing Company Ltd., New Delhi, 1998

PTCE 2035   **MATHEMATICAL MODELING IN**   **L T P C**
                   WATER RESOURCES ENGINEERING   **3 0 0 3**

OBJECTIVES:
- To introduce the student to the concept of hydraulic, hydrology and ground water models in management of Water Resources.
- At the completion of the course the students should be able to understand and build the mathematical models for various problems in water resources management.

UNIT I   MATHEMATICAL MODELLING   6
Role of models in water resources engineering – basic concept of model study- Planning model - operational model- elements on hydraulic models- Elements of hydrologic models

UNIT I   HYDRAULIC MODELS   7
Over land flow- time of concentration- isochrone- time area diagram- hydraulic routing- kinematics wave model –HEC Models- case studies

UNIT III   HYDROLOGIC MODELS   10
Stream network model- basic concepts of basin simulation- single and multipurpose reservoir operation model (MITSIM) - Storm water management model

UNIT IV   OPTIMIZATION MODELS   10
Basics of optimization – objective of model- linear decision rule with applications – concepts of probability and transitional probability- optimization through Genetic algorithm- Fuzzy logic concepts- case studies

UNIT V   GROUND WATER MODELS   12
Analytical-Analog models- model of a aquifer- finite difference approximation- Introduction to Finite element technique to solve Ground water flow equation- contaminant transport model using Visual Modflow software.

TOTAL: 45 PERIODS

TEXT BOOKS
1. John E. Gribbin, Introduction to hydraulics and hydrology with applications for Stormwater Management, DELMAR, Thomson Learning, United states of America, 2002.
2. Remson I, Hornberger G.M. and Moiz F.J., Numerical methods in Sub-Surface Hydrology, Wiley Inter Science, New York, 1985.
3. Kazda I, Finite Element Techniques in Ground Water flow studies (with Applications in Hydraulic and Geotechnical Engineering), Elsevier, New York, 1990.

REFERENCES
1. Abbot M.B., Computational hydraulics Elements of the Theory of Free surface flows, Pitman Advanced Publishing Program, London, 1999
2. Loucks Daniel P, Jery R Stedinger and Douglas, A.Haith, Water Resources Systems Planning and Analysis, Prentice Hall, inc., Englewood cliffs, New Jersey, 1981.

PTCE 2036   **INTEGRATED WATER RESOURCES**   **L   T   P   C**
                                MANAGEMENT   **3   0   0   3**

OBJECTIVES:
- To introduce the student to the concept of Ecology, Environment, and Socio-economic disciplines in management of Water Resources.
- At the completion of the course the students should be able to understand the integrated effects of inter disciplinary approach in water resources management.

UNIT I   IWRM Concept   6
Integrated Water Resources Management (IWRM) Definition – Principles- Approaches- Global issues – food securities

UNIT II   RIVER BASIN   12
River basin concept –Multisectoral use- Water shed topology - Stream network – Drainage density –problem – Effect of reservoir on watershed /river regime – river training measure – Reservoir sedimentation and measures.

UNIT III   ENVIRONMENT   8
Impact of land use changes in basin morphology – impact of watershed changes on qualities and quantities

UNIT IV   WATER ECONOMY   7
Economic view of water issues – Economic characteristics of water as good and services – Policy operation for water conservation and sustainable issue – pricing.

UNIT V   SPECIAL TOPICS   12
Eco restoration – Watershed management strategies – Wetlands – Legal and regulatory setting – Public Private Participation – PPP Objectives – Processes – Links between PPP and IWRM.

TOTAL: 45 PERIODS

REFERENCES
1. Eagesen Peters S., Dynamic Hydrology, McGraw Hill Book Company, New York, 1970.
2. Murthy. J.V.S., Watershed Management in India. Wiley Eastern Ltd, New York, 1995.
3. Dalte S.J.C., Soil Conservation and land management, International Book distribution, India, 1986.
4. Sithamparanathan, Rangasamy A, and Arunachalam .N, Ecosystem principles and sustainable agriculture, Scir. Publisher, Chennai, 1999.

PTCE 2037   **PARTICIPATORY WATER MANAGEMENT**

                        L T P C

OBJECTIVES: **3 0 0 3**
- To introduce the student the concept of Peoples involvement in water management.
- At the completion of the course the students should be able to understand the value of Participatory approach for better performance of the completed systems and other facilities through their organized associations.

UNIT I   FUNDAMENTALS OF SOCIOLOGY   6
Sociology – Basic concept – Perspectives of sociology – social system – Sociological Understanding.

UNIT II   CONCEPT OF PARTICIPATION   10
Participatory approach – Necessity – Objectives of participation – Kinds of participation – Resource mobilization – Sustained system performance – Conflict management – Context of participation, factors in the environment.

UNIT III   ORGANIZATIONAL DESIGN   9
Membership and decision making – Leadership and responsibilities – Development strategy – Channels for implementation – Improving agency relations – Technical co-operation – Special roles.   [

UNIT IV   PARTICIPATION IN WATER MANAGEMENT   10
Cost of participation – Benefits of participation – Multiple use of water – Participation in domestic, irrigation, industrial sectors – User roles in participatory management – Participation of women – Incentives for participation.

UNIT V   FARMER ORGANIZATION AND PARTICIPATION   10

Water user association – Activities in irrigation management – User roles in irrigation management – Irrigation groups – Supporting farmer organization and participation – Experimentation, phasing and flexibility - Bureaucratic reorientation - Irrigation management transfer.

                           TOTAL: 45 PERIODS

TEXT BOOKS
1. Desai A.R., Rural sociology in India, Popular Prakashan, Bombay, 1969.
2. Michael C.M., Putting people first, Sociology variables in Rural Development, Oxford University press, London 1985.
3. Uphoff.N., Improving International Irrigation management with Farmer Participation – Getting the process Right – Studies in water Policy and management, New West - View press, Boulder and London,1986.

REFERENCES
1. Chambers R., Managing canal irrigation, Oxford IBM publishing Co. Pvt. Ltd., New Delhi, 1998.
2. Korten F.F and Robert Y. Siy, Jr.,, Transforming a Bureaucracy – The experience of the Philippines National Irrigation Administration, Ateneo De Manila University Press, Manila, 1989.

PTCE 2038   **WATERSHED CONSERVATION AND**   **L   T   P   C**
                              MANAGEMENT   **3   0   0   3**

OBJECTIVES:
- To introduce the student to the concept of dynamic process of a watershed resulting in soil erosion.
- At the completion of the course the students should be able to understand the appropriate Conservation measures to be adopted for remediation of watershed.

UNIT I   WATERSHED   6
Watershed – concept – classification – characteristics- History of erosion – Erosion problems of India – Approaches to soil and water conservation.

UNIT II   SOIL CONSERVATION   12
Soil erosion – Types of soil erosion – Controlling soil erosion – Soil erosion by wind and water – soil conservation practices – vegetative practices – mechanical practices – erosion control in torrents and gullies – soil loss estimation models.

UNIT III   WATER CONSERVATION   9
Need for water conservation – water conservation measures – water harvesting – principle and techniques – flood water harvesting.

UNIT IV   WATERSHED MANAGEMENT   9
Watershed programmes – factors affecting watershed management – planning of watershed works – watershed water resources – watershed management practices.

UNIT V   MANAGEMENT PRACTICES   9
Joint forest management – Grass land farming and management – Range and pastures – Grazing practices – Wasteland development.

                                                        TOTAL: 45 PERIODS

TEXT BOOKS
1. R. Suresh, Soil and Water Conservation Engineering, Standard Publishers distributors, New Delhi, 2000.
2. Ghanshyam Das, Hydrology and Soil conservation Engineering, Prentice-Hall India, New Delhi, 2000.
3. E.M. Tideman, Watershed Management – Guideline for Indian Conditions, Omega Scientific Publishers, New Delhi, 1996.

PTCE 2306   **HYDROLOGY AND WATER RESOURCES**   **L   T   P   C**
                                ENGINEERING   **3   0   0   3**

OBJECTIVE:
- To make students understand the various hydrological processes, estimate the surface and groundwater resources of a drainage basin and to estimate the hydrologic extremes i.e. floods and droughts and their management.

UNIT I   HYDROLOGIC PROCESSES   9
Introduction – Hydrometeorology - Hydrologic cycle - Precipitation and its types - measurements - evaporation, evapotranspiration, infiltration and other abstractions.

UNIT II   SURFACE RUNOFF   9
Drainage basins – hydrologic losses and rainfall excess – hydrograph analysis – unit hydrograph – S-curve Synthetic unit hydrograph – Rainfall-runoff models - SCS method – stream flow measurements.

UNIT III   GROUNDWATER   9
Groundwater concepts – properties and types of aquifer – saturated flow – steady state one dimensional flow – steady state well hydraulics – unsteady groundwater flow – Theis method and Jacobs method – Ground Water Estimation by GEC norms - geophysical exploration - sea water intrusion.

UNIT IV   RESERVOIR PLANNING AND MANAGEMENT   9
Single and multipurpose projects – dams – types – fixation of storage capacity – Strategies for reservoir operation – reservoir sedimentation.

UNIT V   FLOODS AND DROUGHTS   9
Definition of floods and droughts – frequency analysis – flood control measures – Inter basin water transfer – drought indices - drought prone area programme – artificial recharge – rain water harvesting.

TOTAL: 45 PERIODS

TEXT BOOKS
1. Subramanya .K. Engineering Hydrology- Tata McGraw Hill, 2003.
2. Raghunath .H.M., Hydrology, Wiley Eastern Ltd., 2004.
3. Linsley, R.K. and Franzini, J.B. Water Resources Engineering, McGraw Hill International Book Company, 2000
4. Ven Te Chow, Maidment, D.R. and Mays, L.W. Applied Hydrology, McGraw Hill International Book Company, 1998.

PTCE 2039   TRANSPORTATION PLANNING AND SYSTEMS

L T P C
3 0 0 3

OBJECTIVE:
- To give an exposure on overview of the principles of the bus and rail transportation planning and evaluation of the transportation projects.

UNIT I   STUDY AREA AND SURVEYS   10
Importance of planning and integrated transport facilities in urban areas – Delineation of study area and zoning - Conducting various surveys – Travel patterns, transport facilities and planning parameters.

UNIT II   MODES   7
Basics of trip generation – Trip distribution – Trip assignment and modal split models- Validation of the model.

UNIT III   PLAN PREPARATION AND EVALUATION   8
Preparation of alternative plans – Evaluation techniques – Economic and financial evaluation – Environment Impact Assessment (EIA) – Case studies

UNIT IV   BUS TRANSPORTATION   10
Characteristics of bus transportation in urban areas – Fare policy – route planning – Planning of terminals – Break even point and its relevance.

UNIT V   RAIL TRANSPORTATION   10
Characteristics of suburban, IRT and RRT systems – Planning of rail terminals – Fare policy _ unified traffic and transport authority.

TOTAL: 45 PERIODS

TEXT BOOKS
1. Michael J.Bruton. Introduction to Transportaion Planning, Hutchinson, London, 1995.
2. Kadiyali.L.R. Traffic Engineering and Transport Planning, Khanna Publishers, Delhi,1997.

REFERENCE:
1. John W.Dickey, Metropolitan Transportation Planning, Tata Mcgraw Hill Publishing Company Ltd, New Delhi, 1990.
2. Comprehensive Traffic and Transportaion Studies for Madras Metropolitan Development Area, Madras Metropolitan Development Authority 1995.

PTCE 2040   TRAFFIC ENGINEERING AND MANAGEMENT   L   T   P   C
                                                      3   0   0   3

OBJECTIVE:
- To give an overview of Traffic engineering - Various surveys to be conducted, traffic regulation, management and traffic safety.

UNIT I   TRAFFIC CHARACTERISTICS   10
Road Characteristics – Classification – Functions and standards – Road user characteristics – PIEV theory – Vehicle – Performance characteristics – Fundamentals of Traffic Flow – Urban Traffic problems in India

UNIT II   TRAFFIC SURVEYS   7
Traffic Surveys – Speed, journey time and delay surveys – Vehicle Volume Survey – Methods and interpretation – Origin Destination Survey – Methods and presentation – Parking Survey – Methods, interpretation and presentation – Statistical applications in traffic studies and traffic forecasting – level of service – Concept, application and significance.

UNIT III   TRAFFIC ENGINEERING REGULATION AND CONTROL   8
Capacity of Rotary intersection and Design – Capacity of signalized intersections – Traffic signals, warrants, type – Design and coordination – Traffic regulation principles and enforcement – Traffic controls, traffic signals and markings and enforcement.

UNIT IV   TRAFFIC SAFETY AND ENVIRONMENT   10
Road accidents – Causes, effect, prevention, and cost – street lighting – Traffic and environment hazards – Air and Noise Pollution, causes, health effects and abatement measures.

UNIT V   TRAFFIC MANGEMENT   10
Area Traffic Management System – One way street system, exclusive traffic lanes, tidal flow operation, staggering of work hours and road pricing – Non road pricing options _ Parking charges, Public transport, Subsidies, Vehicle License fees, Road Building, Permit system, Physical Traffic Management Transport System Management (TSM) and Transport Demand Management (TDM)   .

TOTAL: 45 PERIODS

TEXT BOOKS
1.   Khanna .K and Justo C.E.G. Highway Engg., Khanna Pub., Roorkee, 1995.
2.   Kadiyali.L.R. Traffic Engg. and Transport Planning, Khanna Pub., Delhi,1997.
3.   Agarwal M.K Urban Trnsportation in Indai, Allied Publishers Limited, 1996.

REFERENCES
1.   Manual of Transportation Engineering Studies, Institute of Transportaion Engineering, Prentice Hall Publications,1994
2.   John E Tyworth, Traffic Management Planning, Operations and control, Addison Wesly Publishing Company, 1997.
3.   Hobbs.F.D. Traffic Planning and Engg., University of Brimingham, Peragamon Press Ltd, 1994.
4.   Taylor MAP and Young W, Traffic Ansalysis – New Technology and New Solutions, Hargreen Publishing Company , 1998.
5.   Jason C.Yu Transportation Engineering, Introduction to Planning, Design and Operations , Elseevier, 1992.

PTCE 2041   **TRANSPORTATION ENGINEERING**
            – DOCKS AND HARBOURS   **L   T   P   C**
                                                  3   0   0   3

OBJECTIVE:
- To introduce the various components in Docks and Harbour. The planning and design principles of various components in Docks and harbours will be covered

UNIT I   WIND, TIDES AND CURRENTS   9
Wind characteristics – Tide producing forces – Tidal theories – Types of ocean currents – Littoral drift – Coastal erosion and protection works.

UNIT II   PLANNING OF PORT AND HARBOURS   9
Elements of harbours – Types of harbours – Size and shape of harbours – Planning of harbours and ports – Choice of site – Estimating the traffic – Turning basin, approach channel, entrance channel – Site investigation.

UNIT III   BREAK WATERS AND DREDGING   9
Types of break waters and factors determining their selection – Location, arrangement, design and construction of various types of break waters – Dredging – Objectives, types and equipments.

UNIT IV   PORT FACILITIES   9
General aspects of selection and design – Piers, wharves, quay walls, jetties, dolphins, trestle, moles, fenders and moorings, lock and lock gates – Dry and wet docks – Transit sheds and ware houses.

UNIT V   COASTAL SHIPPING   9
Coastal shipping – Inland navigation – Container transportation – Environmental concerns in port construction – Coastal regulation zones – Navigational aids.

TOTAL: 45 PERIODS

TEXT BOOK
1. Seetharaman.S, Dock and Harbour Engineering, Umesh Publications, New Delhi.

REFERENCES
1. S.P.Bindra, A Course in Docks and Harbour Engineering, Dhanpat Ray and sons, New Delhi, 1993.
2. Alonzo DeF. Quinn, Design and Construction of Ports and Marine structures, McGraw- Hill Book Company, New York.
3. Per Bruun et all, Port Engineering, Gulf publishing company, Huston, 1981.
4. R.Srinivasan, Harbour, Dock and Tunnel Engineering, Charotar Book stall, Anand, India.

PTCE 2042   **TRANSPORT AND ENVIRONMENT**   **L T P C**
                                 3 0 0 3

OBJECTIVE:
- The objective of this course is to create an awareness / overview of the Impact of Transportation Projects on the Environment and Society.

UNIT I   INTRODUCTION   8
Environmental Inventory, Environmental Assessment, Environmental Impact Assessment (EIA), Environmental Impact of Transportation Projects, Need for EIA, EIA Guidelines for Transportation Project, Historical Development

UNIT II   METHODOLOGIES   8
Elements of EIA – Screening and Scoping – Methods of Impact Analysis – Applications – Appropriate Methodology

UNIT III   ENVIRONMENTAL IMPACT, PREDICTION AND ASSESSMENT 10
Prediction and Assessment of Impact of Transportation Project at various stages on water, air, noise, land, acquisition and resettlement, Socio-economic impact, indigenous people, aesthetics, health and safety, energy studies, IRC guidelines.

UNIT IV   ENVIRONMENTAL MITIGATION AND MANAGEMENT PLAN 10
Mitigation of the impact on natural and man-made Environment, health, water, land, noise, air, public participation, Environmental Management Plan, Energy Conservation, Methods to reduce global warming

UNIT V   EIA CASE STUDIES   9
EIA Case Studies on Highway, Railway, Airways and Waterways Projects

                    TOTAL: 45 PERIODS

TEXT BOOKS
1. Canter, L.R, "Environmental Impact Assessment, McGraw Hill, New Delhi, 1996
2. T.F.Fwa, Hand Book of Highway Engineering.
3. Indian Road Congress (IRC), Environmental Impact of Highway Projects, IRC, Delhi 1998
4. P.Meenakshi; Elements of Environmental Science and Engineering, Prentice Hall of India, New Delhi, 2006
5. Thirumurthy A.M.; Introduction to Environmental Science and Management, Shroff Publishers, Bombay, 2005

REFERENCES
1. John,G.Rau and David, C.Hooten; Environmental Impact Analysis Handbook, Mc.Graw Hill Book Company, 1995
2. James H.Banks; Introduction to Transportation Engineering, McGraw Hill Book Company, 2000
3. World Bank; A Handbook on Roads and Environment, Vol. I & II, Washington DC, 1997
4. Priya Ranjan Trivedi; International Encyclopedia of Ecology and Environment – EIA, Indian Institute of Ecology and Environment, New Delhi, 1998

PTCE 2043   **PAVEMENT MANAGEMENT SYSTEMS**

                                                  L T P C
                                                  3 0 0 3

OBJECTIVE:
- To introduce the concepts of design, evaluation and performance of existing and new flexible and rigid pavements with due emphasis on systems approach and performance prediction models.

UNIT I   **PAVEMENT MANAGEMENT PROCESS**   **9**
Historical background – General nature and applicability of systems methodology – Basic components of Pavement Management System – Planning pavement investments

UNIT II   **EVALUATION AND PERFORMANCE**   **9**
General concepts –Economic and functional evaluation – Evaluation of pavement performance –Evaluation of structural capacity - Pavement distresses - Condition surveys – Safety evaluation

UNIT III   **DESIGN STRATEGIES**   **12**
Framework for pavement design – Design objectives and constraints – Basic structural response models – Characterization of physical design inputs – generating alternative pavement design – Economic evaluation of alternative design – Analysis of alternative design strategies – Selection of optimal design strategy

UNIT IV   **PERFORMANCE PREDICTION MODELS**   **6**
Techniques for developing prediction models – AASHTO, CRRI and HDM models- Computer applications

UNIT V   **REHABILITATION**   **9**
Repair of pavement defects – Maintenance of flexible and rigid pavements- Bituminous and cement concrete overlays – System analysis

                                          TOTAL: 45 PERIODS

REFERENCES
1. Modern Pavement Management by Ralph Haas, W.Ronald Hudson and John Zaniewski, Kriger Publishing Company, 1994
2. Pavement Management for Airports, Roads and Parking Lots by M.Y.Stalin, Chapman and Hall, New York, 1992
3. Pavements and Surfacing for Highways and Airports by Michael Sargious, Applied Science Publishers Limited, London, 1975

PTCE 2044   COMPUTER APPLICATIONS IN HIGHWAY AND   **L   T   P   C**
                TRANSPORTATION ENGINEERING   **3   0   0   3**

OBJECTIVE:
- To provide knowledge on Computer Applications related to Highway and Transportation Engineering

UNIT I   CAD APPLICATIONS IN HIGHWAY ENGINEERING   12
Writing Programs for Drawing Graphics Elements like Point, Line. Preparation of Cad Drawing for Highway Elements and Transportation Infrastructure.

UNIT II   GIS APPLICATIONS IN TRANSPORTATION PLANNING   12
Road Net Work mapping – Spatial Data preparation Attribute Data input – GIS – Theory and Application – Practical exercise.

UNIT III   COMPUTER AIDED HIGHWAY DESIGN   12
Design of Highway Geometric Elements – Carriageway, shoulders, cross slope etc., Highway Alignment – Practical exercise

UNI IV   PAVEMENTS MANAGEMENT SYSTEM   12
Pavement Surface condition Evaluation methods - Pavement Management   System – Practical exercise

UNIT V   COMPUTER APPLICATIONS IN TRAFFIC ENGINEERING AND
               TRANSPORT PLANNING   12
Signal Design and Signal Coordination – Net work Analysis, Theory, Practice and Case studies

                                TOTAL = 60 PERIODS

REFERENCES
1. Auto Cad Reference Manual
2. Khanna S.K. and C.E.G Justo, Highway Engineering, New Chand and Brothers, Rookers, 1998
3. Robert F Baker (Eds), Hand book of Highway Engineering, Van Nonstrand Keinhood Company, New York, 1975.
4. Ralph Hass & W.Ronald Hudson, Pavement Management System, McGraw Hill Book Company, 1978.

PTCE 2045   **ADVANCED HIGHWAY ENGINEERING**   **L T P C**
                                                                         3 0 0 3

OBJECTIVE:
- To give exposure to the advanced topics in the area of Highway Engineering.

UNIT I   MATERIALS   9
Properties and tests on modified bitumen and bitumen emulsion – IS requirements – advantages Geo synthetics. Types and selection of cement for Pavement Quality Concrete (PQC) – Use of admixtures and fibers in PQC

UNIT II   MIX DESIGN   9
Marshall method of mix design for dense bituminous mixes – Super pave concepts – IRC guidelines and SHRP recommendations - Principles of concrete mix design for pavements – IRC method –recommendations.

UNIT III   ANALYSIS AND DESIGN OF RIGID PAVEMENTS   9

Stresses and deflections in rigid pavements – Design of plain jointed and continuously reinforced cement concrete pavements using IRC method

UNIT IV   ANALYSIS AND DESIGN OF FLEXIBLE PAVEMENTS   9
Stresses and deflection in flexible pavements – Design of flexible pavements using IRC method KENLAYER applications.

UNIT V   MAINTENANCE   9
Factors affecting the performance of flexible and rigid pavements – Performance indicators and evaluation – Use of performance prediction models in maintenance – Recent techniques for repairing pavement defects – Maintenance management system – MOSRTH (India) recommendations.

                                                      TOTAL: 45 PERIODS

TEXT BOOKS
1. Khanna S.K, and Justo C.E.G, Highway Engineering, Khanna Publishers, Roorkee, 1994.
2. Kadiyali L.R, Principles and Practice of Highway Engineering, Khanna Technical Publications, Delhi, 1997.
3. Indian Road Congress (IRC), Guidelines and Special Publications on Highway Planning and Design.

REFERENCES
1. Huang, Yang H, Pavement analysis and Design, Prentice Hall Inc, New Jersy, 2002
2. Vazirani V.N., and S.P.Chandola, Transportaion Engineering, Vol.1, Khanna Publishers, Delhi, 1999.
3. Clarkson H., Oglesby and R.Gary Hicks, Highway Engineering, John Wileysons, 1992.

PTCE 2046   ENVIRONMENTAL IMPACT ASSESSMENT

L   T   P   C
3   0   0   3

OBJECTIVE:
- Students should be conversant with assessment of environmental impacts due to major infrastructure projects and their management

UNIT I   INTRODUCTION   10
Impact of Development on Environment and Environmental Impact Assessment (EIA) and Environmental Impact Statement (EIS) – Objectives – Historical development – EIA Types – EIA in project cycle – capacity and limitations – Legal provisions on EIA – Environmental Impact Assessment Notifications – Environmental Impact Assessment Consultants – Selection & Registration Criteria.

UNIT II   METHODOLOGIES   9
Methods of Categorization of industries for EIA - Elements of EIA – Process screening, Methods of EIA – Strengths, weaknesses and applicability – appropriate methodology solution.

UNIT III   PREDICTION AND ASSESSMENT   9
Prediction and Assessment of Impact on land, water, air, noise and energy, flora and fauna, Socio Economic Impact, Mathematical models for Impact prediction, Public participation – Reports – Exchange of information – Post Environmental Audit.

UNIT IV   ENVIRONMENTAL MANAGEMENT PLAN   9
Plan for mitigation of adverse impact on environment – options for mitigation of impact on water, air and land, water, energy, flora and fauna; Addressing the issues related to the Project Affected People – Environment management Plan – Structure and Documentation. Development of green building concept

UNIT V   CASE STUDIES   8
EIA case studies for new and expansion projects- New Township, wastewater treatment plants, Highways and bridges, Ports and Harbour, Airport, Dams, Irrigation projects, Power plants, Railways.

TOTAL: 45 PERIODS

TEXT BOOKS
1. Canter, R.L. Environmental impact Assessment, McGraw Hill Inc., New Delhi 1996.
2. Anjaneyulu, Y, Environmental Impact Assessment methodologies B.S. Publications, Hyderabad, 2002.
3. S.K. Shukla and P.R. Srivastava, Concepts in Environmental Impact Analysis, Common Wealth Publishers, New Delhi, 1992.

REFERENCES
1. John G. Rao and David C.Hooten (Ed.), Environmental Impact Analysis Handbook, McGraw Hill Book Company, 1990.
2. Environmental Assessment Source book, Vol. II and III. The World Bank, Washington, D.C., 1991.
3. Judith Petts, Handbook of Environmental Impact Assessment Vol.I and II, Blackwell Science, New York, 1998.

PTCE 2047   **GLOBAL CLIMATE CHANGE**   **L   T   P   C**
                                                          3   0   0   3

OBJECTIVE:
- To expose the students to the complexities, impacts on socio economic and environmental spheres and initiatives to mitigate Global Climate Change

UNIT I   INTRODUCTION   5
Ancient Earth - Climate and Chemical Histories, Paleo-indicators of climate, Global energy balance, Concern about Climate Change, Climate Change and Sustainable development.

UNIT II   CLIMATE AND WEATHER   7
Factors affecting global, regional and local climates. Tropical, Monsoon, Polar, Desert, Mid-latitude climates and their role in global climate change. Antarctica, Greenland and the North Pole case studies.

**UNIT III   ELEMENTS AND PROCESSES RELATED TO CLIMATE CHANGE
                                                                        8**
Structure and driving forces of the earth. Earth's carbon reservoirs- marine and terrestrial carbon cycles. The Atmosphere - Radiation budget, Circulation, Stability, Chemistry of Atmosphere. Global wind systems, weather maps. Importance of water, Global Ocean Circulation. Industrialization and urbanization - Greenhouse gases, lifestyle changes.

UNIT – IV   IMPACTS OF GLOBAL CLIMATE CHANGE   15
The Greenhouse effect – ecosystems and species interactions, global warming, sea level rise, ozone problem, El Nino and southern oscillation, storms, thunderstorms, tornadoes, changes in agricultural production, droughts, spread of epidemics, wildfires and other extreme weather events. Nuclear winter.

UNIT – V   CLIMATE CHANGE MITIGATION / ADAPTATION   10
Climate change and the political realm. Mission of the Intergovernmental Panel on Climate Change. International agreements and protocols. Future use of energy and fossil fuels. Role of Governments, industries, and individuals. Concept of CDM and carbon finance.

TOTAL: 45 PERIODS

REFERENCES
1.   The Earth System (2nd Edition) - Lee R. Kump, James F.Kasting and Robert C. Crane, Prentice Hall, 2004.
2.   Climate Change 2001: The Scientific Basis - Houghton, J.T., et al., (eds.), Cambridge University Press, Cambridge, U.K. 2001
3.   Earth's Climate: Past and Future - W.F. Ruddiman, W.H. Freeman and Company, 2001

PTCE 2048   MUNICIPAL SOLID WASTE MANAGEMENT

L T P C
3 0 0 3

OBJECTIVE:
- To make the students conversant with different aspects of the types, sources, generation, storage, collection, transport, processing and disposal of municipal solid waste.

UNIT I   SOURCES AND TYPES   8
Sources and types of municipal solid wastes-Waste generation rates-factors affecting generation, characteristics-methods of sampling and characterization; Effects of improper disposal of solid wastes-Public health and environmental effects. Elements of solid waste management – Municipal solid waste (M&H) rules- Integrated management.- Social and Financial aspects; Public awareness; Role of NGO's.

UNIT II   SOURCE REDUCTION AND ON-SITE STORAGE   8
Source reduction of waste- Reduction, Reuse and Recycling - On-site storage methods- Effect of storage, materials used for containers- segregation of solid wastes – Public health and economic aspects of open storage – waste segregation and storage – case studies under Indian conditions.

UNIT III   COLLECTION AND TRANSFER   8
Methods of Residential and commercial waste collection – Collection vehicles – Manpower – Collection routes – Analysis of collection systems; Transfer stations – Selection of location, operation & maintenance; options under Indian conditions – Field problems – solving.

UNIT IV   PROCESSING OF WASTES   12
Objectives of waste processing – Physical Processing techniques and Equipments; Resource recovery from solid waste composting and biomethanation; Thermal processing options- case studies under Indian conditions.

UNIT V   DISPOSAL   9
Land disposal of solid waste; Sanitary land fills – site selection, design and operation of sanitary landfills –Landfill liners - Management of leachate and landfill gas – Land fill bioreactor.-Dumpsite Rehabilitation.

TOTAL: 45 PERIODS

TEXT BOOKS
1.   George Tchobanoglous and Frank Kreith (2002). Handbook of Solid waste Management, Mc Graw Hill, New York.
2.   Paul T Williams (2000), Waste Treatment and Disposal, John Wiley and Sons

REFERENCES
1.   Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2000.
2.   Bhide A.D. and Sundaresan, B.B. Solid Waste Management Collection, Processing and Disposal, 2001, ISBN 81-7525-282-0
3.   Manser A.G.R and Keeling A.A (1996) ,Practical Handbook of Processing and Recycling of Municipal solid Wastes, Lewis Publishers, CRC Press

PTCE 2049   **INDUSTRIAL WASTEWATER POLLUTION**   **L   T   P   C**
PREVENTION AND CONTROL   **3   0   0   3**

OBJECTIVE:
- Students should be conversant with extent of minimizing the generation of wastes and application of control techniques for recovery, reuse and disposal of wastes in Indian Industries.

UNIT I   INDUSTRIAL POLLUTION SCENARIO   7
Industrial scenario in India – sources, generation rates and characteristics of Industrial wastewaters – Environmental impacts – Regulatory Requirements for industrial wastewaters.

UNIT II   INDUSTRIAL POLLUTION PREVENTION   7
Prevention Vs control of Industrial Pollution – Benefits and Barriers – Waste Minimisation Strategies – Waste Minimisation Circles – Zero Discharge concept.

UNIT III   TREATMENT OF INDUSTRIAL WASTEWATERS   12
Physico–chemical treatment processes – Equalization, Neutralization, Oil Separation, Precipitation, Biological treatment processes – Aerobic and Anaerobic Reactors, Tertiary Treatment Processes for removal of dissolved organics and inorganics.

UNIT IV   WASTEWATER REUSE AND RESIDUAL MANAGEMENT   7
Individual and Common Effluent Treatment Plants – Zero Effluent discharge systems – Quality requirements for reuse – Residuals of industrial wastewater treatments – Treatment of hazardous sludge – Solidification – Incineration – secured Land fills – Regulatory requirements – Leachate Treatment.

UNIT V   CASE STUDIES   12
Sources, characteristics and waste treatment Flow sheets for selected industries – Tanneries, Textiles, Diary, Sugar, Pulp and Paper, Distilleries, Refineries, Thermal Power Plants.

TOTAL: 45 PERIODS

TEXT BOOKS
1. S.C.Bhatia, Handbook of Industrial Pollution and Control, Volume I & II, CBS Publishers, New Delhi, 2003
2. Mahajan, S.P., Pollution Control in Process Industries, Tata McGraw Hill Publishing Company, new Delhi, 1991.

REFERENCES
1. Eckenfelder, W.W., Industrial Water Pollution Control, McGraw Hill, 1999.
2. World Bank Group, Pollution Prevention and Abatement Handbook – Towards Cleaner Production, World Bank and UNEP, Washington D.C., 1988.
3. Paul L.Bishop, Pollution Prevention – Fundamentals and Practice, McGraw Hill International, Boston, 2000.

PTCE 2050　　　　　**AIR POLLUTION CONTROL**　　　**L　T　P　C**
　　　　　　　　　　　　　　　　　　　　　　　　　　　　3　0　0　3

OBJECTIVE:
* To impart knowledge on the sources, effects and control techniques of air pollutants and noise pollution.

UNIT I　　INTRODUCTION　　　　　　　　　　　　9
Sources and classification of air pollutants and their effect on human health, vegetation and property – Global issues and Air pollution – Ambient air quality and emission standards – Air pollution indices – Indoor Air Pollutants – Air quality Sampling and Monitoring.

UNIT II　　AIR POLLUTION METEOROLOGY & DISPORSION MODELS　　8
Fundamentals of meteorology – Wind roses – Atmospheric stability – Plume behaviour – Atmospheric diffusion theories – Plume rise – Gaussian Dispersion Models – Application.

UNIT III　　CONTROL TECHNOLOGIES　　　　　　　16
Principles and Equipment description of control technologies – Gravitational, Centrifugal, Filtration and Electrostatic Precipitator for control of particulate air pollutants – Absorption, adsorption, Condensation, incineration and Bio-filtration for control of gaseous air pollutants – Case studies.

UNIT IV　　EMERGING TRENDS　　　　　　　　7
Radioactive pollution and its control - Automobile Air Pollution and its Control – Uttraviolet photolysis – High efficiency Particulate Air Filters – Control of Indoor Air Quality.

UNIT V　　NOISE POLLUTION & CONTROL　　　　　5
Sources, effects and control of noise – Noise standards – Measurement – Control and Preventive measures.

　　　　　　　　　　　　　　　　　　　　　TOTAL:　45 PERIODS
TEXT BOOKS
1. Rao C.S., Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi, 1996.
2. Anjaneyulu, Y, Air Pollution and Control Technologies, Allied Publishers, Chennai, 2002.

REFERENCES
1. Lawrence K.Wang, Norman C Perelra, Yung-Tse-Hung, Air Pollution Control Engineering, Tokyo, 2004.
2. Noel de Nevors, Air Pollution Control Engineering, McGraw Hill, New York, 1995
3. W.L.Heumann, Industrial Air Pollution Control Systems, McGraw Hill, New York, 1997.

PTCE 2051   **PAVEMENT ENGINEERING**

                                                        L T P C

                                                         3 0 0 3

OBJECTIVE:
- Student gains knowledge on various IRC guidelines for designing rigid and flexible 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   8

Introduction – Pavement as layered structure – Pavement types: rigid and flexible. Resilient modulus - Stress and deflections in pavements under repeated loading.

UNIT II   DESIGN OF FLEXIBLE PAVEMENTS   10

Flexible pavement design - factors influencing design of flexible pavement, Empirical - Semi empirical and theoretical methods – Design procedure as per IRC guidelines – Design and specification of rural roads.

UNIT III   DESIGN OF RIGID PAVEMENTS   9

Cement concrete pavements - factors influencing CC pavements – Modified Westergaard approach – Design procedure as per IRC guidelines – Concrete roads and their scope in India.

UNIT IV   PERFORMANCE EVALUATION AND MAINTENANCE   10

Pavement Evaluation - causes of distress in rigid and flexible pavements – Evaluation based on Surface Appearance, Cracks, Patches and Pot Holes, Undulations, Raveling, Roughness, Skid Resistance. Structural Evaluation by Deflection Measurements - Pavement Serviceability index - Pavement maintenance (IRC Recommendations only).

UNIT V   STABILISATION OF PAVEMENTS   8

Stabilisation with special reference to highway pavements – Choice of stabilizers – Testing and field control Stabilisation for rural roads in India – use of Geosynthetics in roads.

                                                   TOTAL: 45 PERIODS

TEXT BOOKS
1. Wright P.H. "Highway Engineers", John Wiley and Sons, Inc. New York, 1996.
2. Khanna, S.K. and Justo C.E.G. "Highway Engineering", New Chand and Brothers, (8th Edition) Roorkee, 2001.
3. Kadiyali, L.R. 'Principles and Practice of Highway Engineering", Khanna tech. Publications, New Delhi, 1989.

REFERENCES
1. Yoder, R.J. and Witchak M.W. "Principles of Pavement Design", John Wiley 2000.
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.

PTCE 2052   **INTRODUCTION TO SOIL DYNAMICS**
                     AND MACHINE FOUNDATIONS   **L T P C**
                                                           3 0 0 3

OBJECTIVE:
- At the end of the course, student is expected to assess various design dynamic properties of soil, design of foundation for common machineries and also about the measures to isolate vibration due to the operations of machines.

UNIT I   THEORY OF VIBRATION   **9**
Vibration of elementary systems-vibratory motion-single degree freedom system-free and forced vibration with and without damping. Principles of vibration measuring instruments.

UNIT II   WAVES AND WAVE PROPAGATION   **9**
Wave propagation in an elastic homogeneous isotropic medium-Rayleigh, shear and compression waves-waves in elastic half space.

UNIT III   DYNAMIC PROPERTIES OF SOILS   **9**
Elastic properties of soils-coefficient of elastic uniform and non-uniform compression and shear-effect of vibration dissipative properties of soils-determination of dynamic properties of soil-codal provisions.

UNIT IV   DESIGN PROCEDURES   **9**
Design criteria – dynamic loads – simple design procedures for foundations of reciprocating, impact and rotary type machines - Codal provisions (Simple cases).

UNIT V   VIBRATION ISOLATION   **9**
Vibration isolation technique - foundation isolation- isolation by location-isolation by barriers-active and passive isolation methods.

                                           TOTAL: 45 PERIODS

TEXT BOOKS
1. Swamisaran, "Soil Dynamics and Machine Foundations", Galgotia Publications Pvt. Ltd. 1999.
2. Kameswara Rao, "Dynamics Soil Tests and Applications", Wheeler Publishing, New Delhi, 2003.

REFERENCES
1. Kamaswara Rao, "Vibration Analysis and Foundation Dynamics", Wheeler Publishing, New Delhi, 1998.
2. IS Code of Practice for Design and Construction of Machine Foundations, McGrew Hill,1996
3. Moore, P.J. "Analysis and Design of Foundation for Vibration", Oxford and IBH, 2005.

PTCE 2053   GEOTECHNICAL ENGINEERING PROCESSES   L   T   P   C
AND APPLICATIONS   3   0   0   3

OBJECTIVE:
- At the end of the course student gains knowledge to study the various process involved in stabilising problematic soils and also mitigate the geotechnical problems associated with natural disaster.

UNIT I   REGIONAL DEPOSITS AND WASTE MATERIALS   9
Geotechnical problems associated with alluvial, lateritic and black cotton soils, solid wastes like municipal waste and flyash; characterization, prediction and improvement of their properties -Applications; case studies.

**UNIT II   ENVIROMENTAL PROBLEMS ASSOCIATED WITH
GEOTECHNICAL ENGINEERING   9**
Environmental problems related to Soil contamination - waste generation - geotechnical engineering: vibration problems and control; Rain induced land slides. Bearing capacity and compressibility of land fills. Site remediation - utilization of waste for improvement of site.

UNIT III   IN-SITU TREATMENT   10
In-situ treatment of soils: Dynamic consolidation, Vibraflotation, Sand pile, Stone columns – Grouting – Equipments and methods. In-situ treatment of cohesive soils- Electrical and thermal methods, Preloading with sand drains, lime piles.

UNIT IV   SOIL REINFORCEMENT   8
Concepts of Reinforced Earth – Types of reinforcement – Applications to footings and earth retaining walls.

UNIT V   GEOTEXTILES AND GEOGRIDS   9
Geogrids as reinforcement, Geotextiles in filtration, drainage and road works: Applications.

TOTAL: 45 PERIODS

TEXT BOOKS
1. Purushthama Raj, P. Ground Improvement Techniques, Laxmi Publs. (P) Ltd. New Delhi, 1999.
2. Sharma, H.D; and Reddy, K.R. Geoenvironmental Engineering:- Site remediation – Waste containment and emerging waste management Technologies, John   Wiley & Sons INC, New Jersey, 2004.
3. Coduto. D.P., Geotechnical Engineering: Princples and Practices, Prentice Hall of India Pvt.Ltd., New Delhi, 2002.
4. Koerner, R.M., Designing with Geosynthetics Prentice Hall, 4th Edition, New Jersey, 1999.

REFERENCES
1. Das B.M ,Principles of Geotechnical Engineering (V Edition),. Thomson, Singapore, 2004.
2. Craig, R.F. Soil Mechanics (VII Edition), Spon Press, 2004.
3. Rowe R.K., "Geotechnial and Geoenvironmental Engineering Handbook, Kluwer Academic Publishers, 2007.

PTCE 2054   **ROCK ENGINEERING**   **L   T   P   C**
                                                                3   0   0   3

OBJECTIVE:
- To impart knowledge on fundamentals of rock mechanics and its application in solving simple problems associated with rock slopes and underground openings. 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   6
Geological classification – Index properties of rock systems – Classification of rock masses for engineering purpose.

UNIT II   ROCK STRENGTH AND FAILURE CRITERIA   12
Modes of rock failure – Strength of rock – Laboratory and field measurement of shear, tensile and compressive strength. Stress - stain behaviour of rock under 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 – measurements of in-situ stresses.

UNIT IV   APPLICATION OF ROCK MECHANICS IN ENGINEERING   10
Simple engineering application – Underground openings – Rock slopes – Foundations and mining subsidence.

UNIT V   ROCK BOLTING   7
Introduction – Rock bolt systems – Choice of rock bolt based on rock mass condition - rock bolt installation techniques – Testing of rock bolts.
                                                      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 Tech Publications, 1996.
3. Brady, B.H.G. and Brown, E.T., Rock mechanics for underground mining (Third Edition), Kluwer Academic Publishers, Dordrecht, 2004.

REFERENCES
1. Brown, E.T. "Rock Characterization Testing and Monitoring", Pergaman Press 1991.
2. Arogyaswamy, R.N.P., Geotechnical Application in Civil Engineering", Oxford and IBH, 1991.
3. Hook E.and Bray J., Rock slope Engineering, Institute of Mining and Metallurgy", U.K. 1991.

		L T P C
PTCE 2403	**GROUND IMPROVEMENT TECHNIQUES**	**3 0 0 3**

OBJECTIVE:
- At the end of the course student is expected to identify the problematic soil and suitable suggest remedial measures to improve their behaviour.

UNIT I   PROBLEMATIC SOIL AND IMPROVEMENT TECHNIQUES   8
Role of ground improvement in foundation engineering – methods of ground improvement – Geotechnical problems in alluvial, lateritic and black cotton soils – Selection of suitable ground improvement techniques based on soil conditions.

UNIT II   DEWATEREING   10
Dewatering Techniques - Well points – Vacuum and electroosmotic methods – Seepage analysis for two – dimensional flow for fully and partially penetrated slots in homogeneous deposits (Simple cases only).

**UNIT III   INSITU TREATMENT OF COHESIONLESS AND
                COHESIVE SOILS   10**
In-situ densification of cohesion-less soils and consolidation of cohesive soils: Dynamic compaction Vibroflotation, Sand compaction piles and deep compaction. Consolidation: Preloading with sand drains, and fabric drains, Stone columns and Lime piles-installation techniques only – relative merits of above methods and their limitations - stabilization of expansive soils.

UNIT IV   EARTH REINFORCEMENT   9
Concept of reinforcement – Types of reinforcement material – Reinforced earth wall – Mechanism – simple design - applications of reinforced earth. Role of Geotextiles in filtration, drainage, separation and road works.

UNIT V   GROUT TECHNIQUES   8
Types of grouts – Grouting equipments and machinery – injection methods – Grout monitoring – stabilization with cement, lime and chemicals.

TOTAL: 45 PERIODS

TEXT BOOKS
1. Purushothama Raj, P.Ground Improvement Techniques, Laxmi Publcs. (P) Ltd. New Delhi, 1999.
2. Koerner, R.M. Construction and Geotechnical Methods in Foundation Engineering, McGraw Hill, 1994.

REFERENCES
1. Moseley, M.P., Ground Improvement Blockie Academic and Professional, Chapman and Hall, Glassgow, 1998.
2. Jones J.E.P. Earth Reinfocement and Soil Structure, Butterworths, London, 1985.
3. Winterkorn, H.F. and Fang, H.Y. "Foundation Engineering Hand Book". Van Nostrand Reinhold, 1994.
4. Das, B.M. – "Principles of Foundation Engineering" (Fifth edition), Thomson Asia Pvt.Ltd., Singapore, 2003.
5. Coduto, D.P. "Geotechnical Engineering Principles and Practices", Prentice Hall of India Pvt.Ltd. New Delhi, 2002.

PTGI 2403   **GEOGRAPHIC INFORMATION**   **L T P C**
                       SYSTEM APPLICATIONS   **3 0 0 3**

OBJECTIVE:
- To provide exposure to applications of GIS in various application domains through case studies

UNIT I   NATURAL RESOURCE MANAGEMENT APPLICATIONS   9
Forestry: Resource Inventory, Forest Fire Growth modelling – Land: Change detection studies, Watershed Management studies – Water – Identification of Ground Water Recharge- Resource Information System – Wet lands Management

UNIT II   FACILITY MANAGEMENT APPLICATIONS   9
Utilities – Water utility applications – Electric Utility Application – Telecommunication: Tower Spotting – Other utilities

UNIT III   LOCATION BASED SERVICES APPLICATIONS   9
Vehicle Tracking: Automatic Vehicle Location (AVL), Components of AVL :In Vehicle Equipment, Various Communication Channels, Web Server, Client – Vehicle Tracking- Alarms used in Vehicle Tracking, Fleet Management - Vehicle Navigation – Emergency Call: Distress Calls

UNIT IV   LAND INFORMATION SYSTEM APPLICATIONS AND
                    ALIGNMENT STUDIES   9
Land Information System (LIS) – Tax Mapping – Other LIS applications – Pipe line routing, Highway alignment

UNIT V   MISCELLANEOUS TOPICS   9
Disaster Management Applications, Web GIS applications, Health applications

TOTAL: 45 PERIODS

TEXT BOOKS
1.   Laura Lang, Managing Natural Resources with GIS,ESRI Press, 1998.
2.   A.Van Dijk M. G. Bos , GIS and Remote Sensing Techniques in Land-And-Water-Management, Kluwer Academic Publishers, 2001.
3.   Uzair M. Shamsi, U. M. Shamsi GIS Tools for Water, Wastewater, and Stormwater Systems, Asce Press,2002.
4.   Alan L., MD Melnick, Introduction to Geographic Information Systems for Public Health, Aspen Publishers, 1st edition,2002.
5.   Lisa Godin, GIS in Telecommunications Management, ESRI Press,1st edition 2001.
6.   Laura Lang, GIS for Health Organizations, ESRI Press, 2000
7.   Amin Hammad, Hassan Karimi, Telegeoinformatics: Location-based Computing and Services, CRC Press, 1 edition, 2004.

REFERENCE
1.   Paul A Longley, Michael F Goodchild, David J Maguire, David W Rhind,Geographical Information Systems, Volume I and II, John Wiley and Sons, Inc., 1999

PTGI 2202   **CARTOGRAPHY**

                                              L T P C

OBJECTIVE:
                                              3 0 0 3

- The main objective of this course, is to introduce Cartography, and its elements as the Art and Science of Map Making. The course also describes its connections with the Communication Science and Digital Computer as structured and need based information of Spatial Data.

UNIT I   FUNDAMENTALS OF CARTOGRAPHY   9
Cartography today – Nature of Cartography – History of Cartography – Cartographic Visualization – Web Cartography – Graticules – Cartometry –Map Characteristics - Modern Trends.

UNIT II   EARTH   9
Earth-Map Relations – Basic Geodesy – Map Projections – Scale – Reference and Coordinate system – Transformation – Basic Transformation – Affine 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 digitising.

UNIT IV   PERCEPTION AND DESIGN   9
Cartographic design – Colour theory and models – Colour and pattern creation and specification – colour and pattern – Typography and lettering the map – Map compilation – Demography and Statistical mapping.

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 Elsevier Applied Science Publishers 3rd Edition, 2004.
2. ARTHUR, H. ROBINSON Et al Elements of Cartography, Seventh Edition, John Wiley and Sons, 2004.
3. John Campbell, introductory Cartography Third Edition, 2004. Wm.C. Brown Publishers.
4. MENNO –JAN KRAAK & FERJAN ORMELING ,Cartography Visualization of Geospatial Data, Second Edition, Pearson 2004

PTGI 2254   **ELECTRONIC SURVEYING**

                                           L   T   P   C
                                           3   0   0   3

OBJECTIVE:
- To understand the working of EDM equipment and solve the surveying problems with an EDM equipment.

UNIT I   FUNDAMENTALS   5
Methods of Measuring Distance, Basic Principles of EDM, Historical Development Classifications, applications and comparison with conventional surveying.

UNIT II   BASIC ELECTRONICS   10
Oscillators (Crystal controlled and Gunn diode) Kerrcell / Pockel's modulator, Frequency mixing, modulation and Demodulation Measurement of phase differences, reflectors (Corner, Antenna), Transducers and power sources.

UNIT III   ELECTROMAGNETIC WAVES   20
Classification and applications of Electromagnetic waves, Propagation properties, wave propagation at lower and higher frequencies. Refractive index, factors affecting RI, Computation of group refractive index for light and near infrared waves at standard conditions and ambient conditions. Computation of RI for microwaves. Reference refractive index. Real time application of first velocity correction. Measurement of atmospheric parameters. Mean refractive index, Second velocity correction, Total atmospheric correction, Use of temperature and pressure transducers.

UNIT IV   ELECTROMAGNETIC DISTANCE MEASURING SYSTEM   10
Electro-optical system: Measuring principle ,Working principle, Sources of Error, Infrared and Laser EDM instruments. Microwave system: Measuring principle, Working principle, Sources of Error, Microwave EDM instruments. Comparison between Electro-optical and Microwave system. Total station and its applications. Care and maintenance of EDM instruments. Modern positioning systems.

UNIT V   FIELD WORK   30
Study of different EDM instruments and Total station. Setting out works, Base line Measurement, EDM traversing: observations and computation of area Trilateration.

TOTAL: 75 PERIODS

REFERENCES
1.   Burnside, C.D. Electromagnetic distance measurement Crosby Lock wood staples, U.K. 1991.
2.   Rueger, J.M. Electronic Distance Measurement, Springer-Verlag, Berlin, 1990.
3.   Laurila, S.H. Electronic Surveying in Practice, John Wiley and Sons Inc, 1993.
4.   Soastamoinen, J.J. Surveyor's guide to Electro-magnetic Distance Measurement, Adam Hilger Ltd., 1997.

PTGI 2353   **CADASTRAL SURVEYING**   **L T P C**
                                                                       3 0 0 3

OBJECTIVE:
- The Objective of this course is to introduce the students to the cadastral survey Methods and its applications in generation of Land information system. Cadastral surveys are those classes of land surveys which are executed for the purpose of systematically recording the land rights, producing register of land holdings or an inventory of land areas, land use and determine land tax.

UNIT I   INTRODUCTION   **8**
History of cadastral survey – Types of survey – Tax – Real Property – Legal cadastre – Graphical and Numerical Cadastre.

UNIT II   CADASTRAL SURVEY METHODS   **12**
Steps in survey of a village – Instruments used for cadastral survey & mapping – Orthogonal, Polar survey methods – Boundary survey – Rectangulation – Calculation of area of Land.

UNIT III   CADASTRAL SURVEY MAINTENANCE   **10**
Resurveys – Measurement of sub-division – Measurement of obstructed lines – Survey of urban areas – Control requirement for urban survey

UNIT IV   MAPPING   **5**
Photogrammetry for cadastral surveying and mapping – Orthophoto map – GPS for cadastral survey.

UNIT V   CADASTRAL MAP REPRODUCTION   **5**
Map projection for cadastral maps – Convensional symbols – map – reproduction processes – Automated cadastral map.

UNIT VI   CADASTRAL OFFICES   **5**
LIS/GIS Organisation of cadastral offices in Tamil Nadu /India – Recent Developments & Modern Trends.

                                             TOTAL: 45 PERIODS

TEXT BOOKS
1. James, M. Anderson and Edward N. Mikhail, Introduction to Surveying, McGraw Hill Book Co, 1985
2. Survey of India, Hand book of Topography
3. Kahmen & Faig, Surveying, Walter de Gruyter, Berlin, 1993.
4. Peter F. Dall, John D. MeLauglin, Land information management, Oxford Press.

REFERENCE
1. Chain Survey and Land records Manuals I & II of Government of Tamil Nadu.

PTGI 2352   **SURVEY ADJUSTMENTS**

L T P C
3 0 0 3

OBJECTIVE:
- To impart skills in survey calculation and adjustment to suit field conditions

UNIT I   MEASUREMENT AND ERROR   9
Concepts of measurement and Error, types of errors, elementary concepts in probability, Reliability of measurement – significant figures. Error Propagation – linearization. Multivariate distribution, the error ellipse, weights and cofactors-Non-linear stochastic variables.

UNIT II   THE CONCEPT OF ADJUSTMENT   9
Introduction - simple adjustment methods. The least squares method, Examples of least squares problems.

UNIT III   LEAST SQUARES ADJUSTMENT   9
Techniques of least squares, the concept of weight, least squares adjustment of indirect Observations, least squared adjustment of observations only.

UNIT IV   ELEMENTARY PROBABILITY THEORY   9
Random events and probability, Random variables, continuous probability distributions, The normal distribution, Expectation – measures of precision and accuracy, covariance and correlati9on, covariance, cofactor and weight matrices, introduction to sampling.

UNIT V   VARIANCE COVARIANCE PROPAGATION   9
Introduction – Derivation of the propagation laws Examples, stepwise propagation, propagation of least squares adjustment of indirect observations, propagation least square adjustment of observations only.

TOTAL: 45 PERIODS

TEXT BOOKS
1. Mikhail, E.M. and Gracie G. Analysis and adjustment of Survey measurements, Van Nostrand Reinhold, New York, 1981
2. Paul.R.Wolf and Charles. D.Ghilani Adjustment Computations –Statistics and least squares in surveying and GIS Jhon Wiley and sons inc1996.

PTMA 2261   **PROBABILITY AND STATISTICS**

L T P C
3 0 0 3

AIM:
To provide the required skills to apply the statistical tools in engineering problems.

OBJECTIVES:
- The students will acquire knowledge of the applications of various probability distributions**.**
- exposure to statistical inference using statistical tools and quality control aspects.

UNIT I   RANDOM VARIABLES   9 + 3
Discrete and Continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions - Functions of a random variable.

UNIT II   TWO-DIMENSIONAL RANDOM VARIABLES   9 + 3
Joint distributions – Marginal and Conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III   TESTING OF HYPOTHESIS   9 + 3
Sampling distributions - Tests for single mean, proportion, Difference of means (large and small samples) – Tests for single variance and equality of variances – χ^2-test for goodness of fit – Independence of attributes – Non-parametric tests: Test for Randomness and Rank-sum test (Wilcoxon test).

UNIT IV   DESIGN OF EXPERIMENTS   9 + 3
Completely randomized design – Randomized block design – Latin square design - 2^2 - factorial design.

UNIT V   STATISTICAL QUALITY CONTROL   9 + 3
Control charts for measurements ($\overline{X}$ and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits -   Acceptance sampling.

TOTAL: 60 PERIODS

TEXT BOOKS
1.   Milton, J. S. and Arnold, J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th edition, 2007.
2.   Johnson, R.A. and Gupta, C.B., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 7th edition, 2007.

REFERENCES
1.   Devore, J.L., "Probability and Statistics for Engineering and the Sciences", Thomson Brooks/Cole, International Student Edition, 7th edition, 2008.
2.   Walpole, R.E., Myers, R.H., Myers, S.L. and Ye, K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia , 8th edition, 2007.
3.   Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists, 3rd edition, Elsevier, 2004.
4.   Spiegel, M.R., Schiller, J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill ed., 2004.

PTMA 2262   **NUMERICAL METHODS**   **3   0   0   3**

AIM:
- This course gives a complete procedure for solving numerically different kinds of problems occurring in engineering and technology.

OBJECTIVES:
The students would be acquainted with the basic concepts of numerical methods and their applications.

UNIT I   SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9 + 3
Solution of algebraic and transcendental equations – Fixed point iteration method – Newton-Raphson method – Solution of linear system of equations – Gauss Elimination method – Pivoting – Gauss-Jordan methods – Matrix Inversion by Gauss-Jordan method – Iterative methods of Gauss-Jacobi and Gauss-Seidel – Eigenvalues of a matrix by Power method and by Jacobi's method.

UNIT II   INTERPOLATION AND APPROXIMATION   9 + 3
Interpolation with unequal intervals – Lagrange interpolation – Newton's divided difference interpolation – Cubic Splines – Interpolation with equal intervals – Newton's forward and backward difference formulae.

UNIT III   NUMERICAL DIFFERENTATION AND INTEGRATION   9 + 3
Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal, Simpson's 1/3 and Simpson's 3/8 rules – Romberg's method – Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's rules.

UNIT IV   INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL
**   EQUATIONS   9 + 3**
Single step-methods – Taylor's series method – Euler's method – Fourth order Runge-Kutta method for solving first and second order equations – Multi-step methods – Milne's and Adams-Bashforth predictor-corrector methods for solving first order equations.

UNIT V   BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL
**   DIFFERENTIAL EQUATIONS   9 + 3**
Finite difference methods for solving two-point linear boundary value problems. Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat-flow equation by explicit and implicit (Crank Nicholson) methods - One dimensional wave equation by explicit method.

TOTAL: 60 PERIODS

TEXT BOOKS
1.   Grewal, B.S. and Grewal,J.S., " Numerical methods in Engineering and Science", 6th Edition, Khanna Publishers, New Delhi, 2004.
2.   Sankara Rao, K. "Numerical methods for Scientists and Engineers', 3rd Edition Prentice Hall of India Private Ltd., New Delhi, 2007.

REFERENCES:
1. Chapra, S. C and Canale, R. P. "Numerical Methods for Engineers", 5th Edition, Tata McGraw-Hill, New Delhi, 2007.
2. Gerald, C. F. and Wheatley, P. O., "Applied Numerical Analysis", 6th Edition, Pearson Education Asia, New Delhi, 2006.
3. Brian Bradie, "A friendly introduction to Numerical analysis", Pearson Education Asia, New Delhi, 2007.

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 BOOK
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.

PTGE 2072   **INDIAN CONSTITUTION AND SOCIETY**

	L	T	P	C
	3	0	0	3

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; Castle, 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.
2.   R.C.Agarwal, (1997) "Indian Political System", S.Chand and Company, New Delhi.
3.   Maciver and Page, "Society: An Introduction Analysis ", Mac Milan India Ltd., New Delhi.
4.   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, "Indian Political System ", New Academic Publishing House, Jalaendhar.
3.   R.N. Sharma, "Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.

PTGE 2073   **CONTRACT LAWS AND REGULATIONS**   **L T P C**
3 0 0 3
`

UNIT I   CONSTRUCTION CONTRACTS   **10**
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   **5**
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   **10**
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   **10**
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.

PTGE 2022 **TOTAL QUALITY MANAGEMENT** **L T P C**
 3 0 0 3

UNIT I NTRODUCTION 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, Third 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.

PTGE 2025   PROFESSIONAL ETHICS IN ENGINEERING   L T P C
3 0 0 3

UNIT I   ENGINEERING ETHICS   9
Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories

UNIT II   ENGINEERING AS SOCIAL EXPERIMENTATION   9
Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study

UNIT III   ENGINEER'S RESPONSIBILITY FOR SAFETY   9
Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – The Government Regulator's Approach to Risk - Chernobyl Case Studies and Bhopal

UNIT IV   RESPONSIBILITIES AND RIGHTS   9
Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) - Discrimination

UNIT V   GLOBAL ISSUES   9
Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct

TOTAL: 45 PERIODS

TEXT BOOKS
1.   Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York 2005.
2.   Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Thompson Learning, 2000.

REFERENCES
1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, (1999).
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, (2003)
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 2023   **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, MOMBE.

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   CHARECTERISATION 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 charecterisation of surfaces & Interfaces", 2nd Edition, Weinheim Cambridge, Wiley-VCH, 2000.

REFERENCES
1. G Timp (Editor), "Nanotechnology", AIP press/Springer, 1999.
2. Akhlesh Lakhtakia (Editor), "The Hand Book of Nano Technology,Nanometer Structure", Theory, Modeling and Simulations", Prentice-Hall of India (P) Ltd, New Delhi, 2007.

PTAG 2211   **ENGINEERING GEOLOGY**

L T P C
3 0 0 3

UNIT I   PHYSICAL GEOLOGY   9
Geology in civil engineering – branches of geology – structure of earth and its composition – weathering of rocks – landforms and processes associated with river, wind and sea – relevance to civil engineering.

UNIT II   MINEROLOGY   9
Physical properties of minerals. Study of the following rock forming minerals – Quartz group, Feldspar group, Pyroxene group, Amphibole and Mica group, Calcite Gypsum and Clay minerals.

UNIT III   PETROLOGY   9
Classification of rocks, distinction between Igneous, Sedimentary and Metamorphic rocks. Engineering properties of rocks. Description, occurrence, engineering properties, distribution and uses of : Granite, Syenite, Diorite, Gabbro, Dolerite, Basalt, Sandstone, Limestone, Laterite, Shale, Conglomerate, Breccia, Quartzite, Marble, Slate, Gneiss and Schist.

UNIT IV   STRUCTURAL GEOLOGY ANG GEOPHYSICAL METHODS   9
Geological maps – attitude of beds, study of structures - folds, faults and joints – relevance to civil engineering. Plate tectonics – Earthquakes – seismic zones in India. Geophysical methods – Seismic and electrical methods for subsurface investigations – prospecting for groundwater.

UNIT V   GEOLOGICAL INVESTIGATION   9
Remote sensing for civil engineering applications; Geological conditions necessary for design and construction of Dams and Reservoirs, Tunnels, Buildings and Road cuttings. Investigation of Landslides, causes and mitigation.

TOTAL: 45 PERIODS

REFERENCES
1.   N. Chenna Kesavulu. Textbook of Engineering Geology, Macmillan India Ltd., 2007.
2.   Venkat Reddy. Engineering Geology for Civil Engineers, D.Oxford & IBH, 1993.
3.   Parbin Singh. A Text book of Engineering and general geology, Katson publishing house, Ludhiana, 1993.
4.   Blyth F.G.H and M. H de Freitas. Geology for Engineers, Edward Arnold, London, 1984.
5.   F.G.Bell. Fundamentals of Engineering Geology, B.S Publications, Hyderabad., 2005, ISBN 81-7800-098-9.

PTCE 2406   **ARCHITECTURE AND TOWN PLANNING**

L T 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", Hutchinson, London, 1990.