ANNA UNIVERSITY, CHENNAI

AFFILIATED INSTITUTIONS

R - 2008

B.E. CIVIL ENGINEERING

II - VIII SEMESTERS CURRICULA AND SYLLABI

SEMESTER II

**(Common to all B.E. / B.Tech. Degree Programmes
except B.E. – Marine Engineering)**

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	HS2161	Technical English – II*	3	1	0	4
2.	MA2161	Mathematics – II*	3	1	0	4
3.	PH2161	Engineering Physics – II*	3	0	0	3
4.	CY2161	Engineering Chemistry – II*	3	0	0	3
5. a	ME2151	Engineering Mechanics **(For non-circuit branches)**	3	1	0	4
5. b	EE2151	Circuit Theory **(For branches under Electrical Faculty)**	3	1	0	4
5. c	EC2151	Electric Circuits and Electron Devices **(For branches under I & C Faculty)**	3	1	0	4
6. a	GE2151	Basic Electrical & Electronics Engineering **(For non-circuit branches)**	4	0	0	4
6. b	GE2152	Basic Civil & Mechanical Engineering **(For circuit branches)**	4	0	0	4
PRACTICAL						
7.	GE2155	Computer Practice Laboratory-II*	0	1	2	2
8.	GS2165	Physics & Chemistry Laboratory - II*	0	0	3	2
9. a	ME2155	Computer Aided Drafting and Modeling Laboratory **(For non-circuits branches)**	0	1	2	2
9. b	EE2155	Electrical Circuits Laboratory **(For branches under Electrical Faculty)**	0	0	3	2
9. c	EC2155	Circuits and Devices Laboratory **(For branches under I & C Faculty)**	0	0	3	2
				TOTAL : 28 CREDITS		
10.	-	English Language Laboratory+	0	0	2	-

* Common to all B.E. / B.Tech. Programmes

+ Offering English Language Laboratory as an additional subject (with no marks) during 2nd semester may be decided by the respective Colleges affiliated to Anna University Chennai.

A. <u>CIRCUIT BRANCHES</u>

I   Faculty of Electrical Engineering

1. B.E. Electrical and Electronics Engineering
2. B.E. Electronics and Instrumentation Engineering
3. B.E. Instrumentation and Control Engineering

II   Faculty of Information and Communication Engineering

1. B.E. Computer Science and Engineering
2. B.E. Electronics and Communication Engineering
3. B.E. Bio Medical Engineering
4. B.Tech. Information Technology

B. <u>NON – CIRCUIT BRANCHES</u>

I   Faculty of Civil Engineering

1. B.E. Civil Engineering

II   Faculty of Mechanical Engineering

1. B.E. Aeronautical Engineering
2. B.E. Automobile Engineering
3. B.E. Marine Engineering
4. B.E. Mechanical Engineering
5. B.E. Production Engineering

III   Faculty of Technology

1. B.Tech. Chemical Engineering
2. B.Tech. Biotechnology
3. B.Tech. Polymer Technology
4. B.Tech. Textile Technology
5. B.Tech. Textile Technology (Fashion Technology)
6. B.Tech. Petroleum Engineering
7. B.Tech. Plastics Technology

SEMESTER III

(Applicable to the students admitted from the Academic year 2008 – 2009 onwards)

COURSE CODE	COURSE TITLE	L	T	P	C
THEORY					
MA 2211	Transforms and Partial Differential Equations	3	1	0	4
GE 2021	Environmental Science and Engineering	3	0	0	3
AG 2211	Applied Geology	3	0	0	3
CE 2201	Mechanics of Solids	3	1	0	4
CE 2202	Mechanics of Fluids	3	1	0	4
CE 2203	Construction Techniques, Equipment and Practice	4	0	0	4
CE 2204	Surveying– I	3	0	0	3
PRACTICAL					
CE 2207	Survey Practical – I	0	0	4	2
CE 2208	Computer Aided Building Drawing	0	0	4	2
	TOTAL	22	3	8	29

SEMESTER IV

(Applicable to the students admitted from the Academic year 2008 – 2009 onwards)

COURSE CODE	COURSE TITLE	L	T	P	C
THEORY					
MA 2264	Numerical Methods	3	1	0	4
CE 2251	Soil Mechanics	3	0	0	3
CE 2252	Strength of Materials	3	1	0	4
CE 2253	Applied Hydraulic Engineering	3	1	0	4
CE 2254	Surveying – II	3	0	0	3
CE 2255	Highway Engineering	3	0	0	3
PRACTICAL					
CE 2257	Strength of Materials Lab	0	0	3	2
CE 2258	Hydraulic Engineering Laboratory	0	0	3	2
CE 2259	Survey Practical – II	0	0	4	2
	TOTAL	18	3	10	27

SEMESTER V

Code No.	Course Title	L	T	P	C
THEORY					
CE2301	Irrigation Engineering	3	0	0	3
CE2302	Structural Analysis I	3	1	0	4
CE2303	Railways, Airports and Harbour Engineering	4	0	0	4
CE2304	Environmental Engineering I	3	0	0	3
CE2305	Foundation Engineering	3	0	0	3
CE2306	Design of RC Elements	3	1	0	4
PRACTICAL					
GE2321	Communication Skills Laboratory**	0	0	4	2
CE2307	Concrete and Highway Engineering Lab	0	0	3	2
CE2308	Soil Mechanics Laboratory	0	0	3	2
	TOTAL	19	2	10	27

SEMESTER VI

Code No.	Course Title	L	T	P	C
THEORY					
MG2351	Principles of Management	3	0	0	3
CE2351	Structural Analysis – II	3	1	0	4
CE2352	Design of Steel Structures	3	1	0	4
CE2353	Construction Planning & Scheduling	3	0	0	3
CE2354	Environmental Engineering II	3	0	0	3
E1***	Elective – I	3	0	0	3
PRACTICAL					
CE2355	Environmental and Irrigation Engineering Drawing	0	0	4	2
CE2356	Environmental Engineering Laboratory	0	0	3	2
CE2357	Survey Camp	-	-	-	3
	TOTAL	18	2	7	27

SEMESTER VII

Code No.	Course Title	L	T	P	C
THEORY					
CE2401	Design of Reinforced Concrete & Brick Masonry Structures	3	1	0	4
CE2402	Estimation and Quantity Surveying	3	0	0	3
CE2403	Basics of Dynamics and Aseismic Design	3	0	0	3
CE2404	Prestressed Concrete Structures	3	0	0	3
E2***	Elective – II	3	0	0	3
E3***	Elective – III	3	0	0	3
PRACTICAL					
CE2405	Computer Aided Design and Drafting Laboratory	0	0	4	2
CE2406	Design Project	0	0	4	2
	TOTAL	18	1	8	23

SEMESTER VIII

Code No.	Course Title	L	T	P	C
THEORY					
CE2451	Engineering Economics and Cost Analysis	3	0	0	3
E4***	Elective – IV	3	0	0	3
E5***	Elective – V	3	0	0	3
PRACTICAL					
CE2453	Project Work	0	0	12	6
	TOTAL	9	0	15	15

** No Examination

LIST OF ELECTIVES

SEMESTER – VI

ELECTIVE - I

Code No.	Course Title	L	T	P	C
CE2021	Hydrology	3	0	0	3
CE2022	Cartography	3	0	0	3
CE2023	Electronic Surveying	3	0	0	3
CE2024	Remote Sensing Techniques and GIS	3	0	0	3
CE2025	Architecture	3	0	0	3
GE2022	Total Quality Management	3	0	0	3
GE2023	Fundamentals of Nanoscience	3	0	0	3
GE2025	Professional Ethics in Engineering	3	0	0	3
GE2071	Intellectual Property Rights (IPR)	3	0	0	3
GE2072	Indian Constitution and Society	3	0	0	3

SEMESTER – VII

ELECTIVE - II

Code No.	Course Title	L	T	P	C
CE2026	Traffic Engineering and Management	3	0	0	3
CE2027	Housing Planning and Management	3	0	0	3
CE2028	Ground Water Engineering	3	0	0	3
CE2029	Management of Irrigation Systems	3	0	0	3
CE2030	Coastal Zone Management	3	0	0	3
CE2031	Water Resources Engineering	3	0	0	3
CE2032	Pavement Engineering	3	0	0	3
CE2033	Ground Improvement Techniques	3	0	0	3
GE2073	Contract Laws and Regulations	3	0	0	3

ELECTIVE – III

Code No.	Course Title	L	T	P	C
CE2034	Introduction to Soil Dynamics and Machine Foundations	3	0	0	3
CE2035	Rock Engineering	3	0	0	3
CE2036	Environmental Impact Assessment of Civil Engineering Projects	3	0	0	3
CE2037	Industrial Waste Management	3	0	0	3
CE2038	Air Pollution Management	3	0	0	3
CE2039	Municipal Solid Waste Management	3	0	0	3
CE2040	Ecological Engineering	3	0	0	3

SEMESTER - VIII

ELECTIVE – IV

Code No.	Course Title	L	T	P	C
CE2041	Bridge Structures	3	0	0	3
CE2042	Storage Structures	3	0	0	3
CE2043	Design of Plate and Shell Structures	3	0	0	3
CE2044	Tall Buildings	3	0	0	3
CE2045	Prefabricated structures	3	0	0	3
CE2046	Wind Engineering	3	0	0	3

ELECTIVE – V

Code No.	Course Title	L	T	P	C
CE2047	Computer Aided Design of Structures	3	0	0	3
CE2048	Industrial Structures	3	0	0	3
CE2049	Smart Structures and smart Materials	3	0	0	3
CE2050	Finite Element Techniques	3	0	0	3
CE2071	Repair and Rehabilitation of Structures	3	0	0	3

• The lab examinations will be held only in the second semester.

HS2161   **TECHNICAL ENGLISH II**   **L T P C**
3 1 0 4

AIM

To encourage students to actively involve in participative learning of English and to help them acquire Communication Skills.

OBJECTIVES

- To help students develop listening skills for academic and professional purposes.
- To help students acquire the ability to speak effectively in English in real-life situations.
- To inculcate reading habit and to develop effective reading skills.
- To help students improve their active and passive vocabulary.
- To familiarize students with different rhetorical functions of scientific English.
- To enable students write letters and reports effectively in formal and business situations.

UNIT I   12

Technical Vocabulary - meanings in context, sequencing words, Articles- Prepositions, intensive reading& predicting content, Reading and interpretation, extended definitions, Process description

Suggested activities:
1. Exercises on word formation using the prefix 'self' - Gap filling with preposition.
2. Exercises - Using sequence words.
3. Reading comprehension exercise with questions based on inference – Reading headings
4. and predicting the content – Reading advertisements and interpretation.
5. Writing extended definitions – Writing descriptions of processes – Writing paragraphs based on discussions – Writing paragraphs describing the future.

UNIT II   12

Phrases / Structures indicating use / purpose – Adverbs-Skimming – Non-verbal communication - Listening – correlating verbal and non-verbal communication -Speaking in group discussions – Formal Letter writing – Writing analytical paragraphs.

Suggested activities:
1. Reading comprehension exercises with questions on overall content – Discussions analyzing stylistic features (creative and factual description) - Reading comprehension exercises with texts including graphic communication - Exercises in interpreting non-verbal communication.
2. Listening comprehension exercises to categorise data in tables.
3. Writing formal letters, quotations, clarification, complaint – Letter seeking permission for Industrial visits– Writing analytical paragraphs on different debatable issues.

UNIT III   12

Cause and effect expressions – Different grammatical forms of the same word - Speaking – stress and intonation, Group Discussions - Reading – Critical reading - Listening, - Writing – using connectives, report writing – types, structure, data collection, content, form, recommendations .

Suggested activities:

Exercises combining sentences using cause and effect expressions – Gap filling exercises using the appropriate tense forms – Making sentences using different grammatical forms of the same word. (Eg: object –verb / object – noun)

1. Speaking exercises involving the use of stress and intonation – Group discussions– analysis of problems and offering solutions.
2. Reading comprehension exercises with critical questions, Multiple choice question.
3. Sequencing of jumbled sentences using connectives – Writing different types of reports like industrial accident report and survey report – Writing recommendations.

UNIT IV   **12**
Numerical adjectives – Oral instructions – Descriptive writing – Argumentative paragraphs – Letter of application - content, format (CV / Bio-data) - Instructions, imperative forms - Checklists, Yes/No question form – E-mail communication.

Suggested Activities:

1. Rewriting exercises using numerical adjectives.
2. Reading comprehension exercises with analytical questions on content – Evaluation of content.
3. Listening comprehension – entering information in tabular form, intensive listening exercise and completing the steps of a process.
4. Speaking - Role play – group discussions – Activities giving oral instructions.
5. Writing descriptions, expanding hints – Writing argumentative paragraphs – Writing formal letters – Writing letter of application with CV/Bio-data – Writing general and safety instructions – Preparing checklists – Writing e-mail messages.

UNIT V   **9**
Speaking - Discussion of Problems and solutions - Creative and critical thinking – Writing an essay, Writing a proposal.

Suggested Activities:

1. Case Studies on problems and solutions
2. Brain storming and discussion
3. Writing Critical essays
4. Writing short proposals of 2 pages for starting a project, solving problems,   etc.
5. Writing advertisements.
                                                                              TOTAL : 60 PERIODS

TEXT BOOK
1. Chapters 5 – 8. Department of Humanities & Social Sciences, Anna University, 'English for Engineers and Technologists' Combined Edition (Volumes 1 & 2), Chennai: Orient Longman Pvt. Ltd., 2006. Themes 5 – 8 (Technology, Communication, Environment, Industry)

REFERENCES
1. P. K. Dutt, G. Rajeevan and C.L.N Prakash, 'A Course in Communication   Skills', Cambridge University Press, India 2007.
2. Krishna Mohan and Meera Banerjee, 'Developing Communication Skills',   Macmillan India Ltd., (Reprinted 1994 – 2007).
3. Edgar Thorpe, Showick Thorpe, 'Objective English', Second Edition,   Pearson Education, 2007.

Extensive Reading:
1. Robin Sharma**, '**The Monk Who Sold His Ferrari', Jaico Publishing House, 2007

Note:
The book listed under Extensive Reading is meant for inculcating the reading habit of the students. They need not be used for testing purposes.

        MA2161   **MATHEMATICS – II**   **L T P C**
                                                                            3 1 0 4

UNIT I   **ORDINARY DIFFERENTIAL EQUATIONS**   **12**
Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT II   **VECTOR CALCULUS**   **12**
Gradient Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelpipeds.

UNIT III   **ANALYTIC FUNCTIONS**   **12**
Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy – Riemann equation and Sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping : w= z+c, cz, 1/z, and bilinear transformation.

UNIT IV   **COMPLEX INTEGRATION**   **12**
Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor and Laurent expansions – Singular points – Residues – Residue theorem – Application of residue theorem to evaluate real integrals – Unit circle and semi-circular contour(excluding poles on boundaries).

UNIT V   **LAPLACE TRANSFORM**   **12**
Laplace transform – Conditions for existence – Transform of elementary functions – Basic properties – Transform of derivatives and integrals – Transform of unit step function and impulse functions – Transform of periodic functions.

Definition of Inverse Laplace transform as contour integral – Convolution theorem (excluding proof) – Initial and Final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

                                                      TOTAL : 60 PERIODS

TEXT BOOK:
1. Bali N. P and Manish Goyal, "Text book of Engineering Mathematics", 3rd Edition, Laxmi Publications (p) Ltd., (2008).
2. Grewal. B.S, "Higher Engineering Mathematics", 40th Edition, Khanna Publications, Delhi, (2007).

REFERENCES

1. Ramana B.V, "Higher Engineering Mathematics",Tata McGraw Hill Publishing Company, New Delhi, (2007).

2. Glyn James, "Advanced Engineering Mathematics", 3rd Edition, Pearson Education, (2007).

3. Erwin Kreyszig, "Advanced Engineering Mathematics", 7th Edition, Wiley India, (2007).

4. Jain R.K and Iyengar S.R.K, "Advanced Engineering Mathematics", 3rd Edition, Narosa Publishing House Pvt. Ltd., (2007).

PH2161   **ENGINEERING PHYSICS – II**   **L T P C**
                                                                                          3 0 0 3

UNIT I   CONDUCTING MATERIALS   9
Conductors – classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

UNIT II   SEMICONDUCTING MATERIALS   9
Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – extrinsic semiconductors – carrier concentration derivation in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration – compound semiconductors – Hall effect – Determination of Hall coefficient – Applications.

UNIT III   MAGNETIC AND SUPERCONDUCTING MATERIALS   9
Origin of magnetic moment – Bohr magneton – Dia and para magnetism – Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti – ferromagnetic materials – Ferrites – applications – magnetic recording and readout – storage of magnetic data – tapes, floppy and magnetic disc drives.
Superconductivity : properties - Types of super conductors – BCS theory of superconductivity(Qualitative) - High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

UNIT IV   DIELECTRIC MATERIALS   9
Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – internal field – Claussius – Mosotti relation (derivation) – dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer) – ferroelectricity and applications.

UNIT V   MODERN ENGINEERING MATERIALS   9
Metallic glasses: preparation, properties and applications.
Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, advantages and disadvantages of SMA
Nanomaterials: synthesis –plasma arcing – chemical vapour deposition – sol-gels – electrodeposition – ball milling - properties of nanoparticles and applications.
Carbon nanotubes: fabrication – arc method – pulsed laser deposition – chemical vapour deposition - structure – properties and applications.

                                                                TOTAL : 45 PERIODS

TEXT BOOKS

1. Charles Kittel ' Introduction to Solid State Physics', John Wiley & sons, 7th edition, Singapore (2007)
2. Charles P. Poole and Frank J.Ownen, 'Introduction to Nanotechnology', Wiley India(2007) (for Unit V)

REFERENCES

1. Rajendran, V, and Marikani A, 'Materials science'Tata McGraw Hill publications, (2004) New delhi.
2. Jayakumar, S. 'Materials science', R.K. Publishers, Coimbatore, (2008).
3. Palanisamy P.K, 'Materials science', Scitech publications(India) Pvt. LTd., Chennai, second Edition(2007)
4. M. Arumugam, 'Materials Science' Anuradha publications, Kumbakonam, (2006).

CY2161   **ENGINEERING CHEMISTRY – II**   **L T P C**
                                                                                        3 0 0 3
AIM

To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.

OBJECTIVES
- The student should be conversant with the principles electrochemistry, electrochemical cells, emf and applications of emf measurements.
- Principles of corrosion control
- Chemistry of Fuels and combustion
- Industrial importance of Phase rule and alloys
- Analytical techniques and their importance.

UNIT I   ELECTROCHEMISTRY   9
Electrochemical cells – reversible and irreversible cells – EMF – measurement of emf – Single electrode potential – Nernst equation (problem) – reference electrodes –Standard Hydrogen electrode -Calomel electrode – Ion selective electrode – glass electrode and measurement of pH – electrochemical series – significance – potentiometer titrations (redox - Fe^{2+} vs dichromate and precipitation – Ag^+ vs Cl^- titrations) and conduct metric titrations (acid-base – HCl vs, NaOH) titrations,

UNIT II   CORROSION AND CORROSION CONTROL   9
Chemical corrosion – Pilling – Bedworth rule – electrochemical corrosion – different types – galvanic corrosion – differential aeration corrosion – factors influencing corrosion – corrosion control – sacrificial anode and impressed cathodic current methods – corrosion inhibitors – protective coatings – paints – constituents and functions – metallic coatings – electroplating (Au) and electroless (Ni) plating.

UNIT III   FUELS AND COMBUSTION   9
Calorific value – classification – Coal – proximate and ultimate analysis metallurgical coke – manufacture by Otto-Hoffmann method – Petroleum processing and fractions – cracking – catalytic cracking and methods-knocking – octane number and cetane number – synthetic petrol – Fischer Tropsch and Bergius processes – Gaseous fuels- water gas, producer gas, CNG and LPG, Flue gas analysis – Orsat apparatus – theoretical air for combustion.

UNIT IV   PHASE RULE AND ALLOYS   9
Statement and explanation of terms involved – one component system – water system – condensed phase rule – construction of phase diagram by thermal analysis – simple eutectic systems (lead-silver system only) – alloys – importance, ferrous alloys – nichrome and stainless steel – heat treatment of steel, non-ferrous alloys – brass and bronze.

UNIT V   ANALYTICAL TECHNIQUES   9
Beer-Lambert's law (problem) – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (problem) (block diagram only) – estimation of iron by colorimetry – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – estimation of nickel by atomic absorption spectroscopy.

TOTAL: 45 PERIODS

TEXT BOOKS
1. P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi (2002).
2. S.S.Dara "A text book of Engineering Chemistry" S.Chand & Co.Ltd., New Delhi (2006).

REFERENCES
1. B.Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).
2. B.K.Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).

ME2151   **ENGINEERING MECHANICS**   **L T P C**
                                                                       3 1 0 4

OBJECTIVE
At the end of this course the student should be able to understand the vectorial and scalar representation of forces and moments, static equilibrium of particles and rigid bodies both in two dimensions and also in three dimensions. Further, he should understand the principle of work and energy. He should be able to comprehend the effect of friction on equilibrium. He should be able to understand the laws of motion, the kinematics of motion and the interrelationship. He should also be able to write the dynamic equilibrium equation. All these should be achieved both conceptually and through solved examples.

UNIT I   BASICS & STATICS OF PARTICLES   12
Introduction – Units and Dimensions – Laws of Mechanics – Lame's theorem, Parallelogram and triangular Law of forces – Vectors – Vectorial representation of forces and moments – Vector operations: additions, subtraction, dot product, cross product – Coplanar Forces – Resolution and Composition of forces – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility – Single equivalent force.

UNIT II   EQUILIBRIUM OF RIGID BODIES   12
Free body diagram – Types of supports and their reactions – requirements of stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions – Examples

UNIT III   PROPERTIES OF SURFACES AND SOLIDS   12

Determination of Areas and Volumes – First moment of area and the Centroid of sections – Rectangle, circle, triangle from integration – T section, I section, - Angle section, Hollow section by using standard formula – second and product moments of plane area – Rectangle, triangle, circle from integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia – Principal moments of inertia of plane areas – Principal axes of inertia – Mass moment of inertia – Derivation of mass moment of inertia for rectangular section, prism, sphere from first principle – Relation to area moments of inertia.

UNIT IV   DYNAMICS OF PARTICLES   12

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton's law – Work Energy Equation of particles – Impulse and Momentum – Impact of elastic bodies.

UNIT V   FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS   12

Frictional force – Laws of Coloumb friction – simple contact friction – Rolling resistance – Belt friction.
Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion.

TOTAL: 60 PERIODS

TEXT BOOK
1. Beer, F.P and Johnson Jr. E.R. "Vector Mechanics for Engineers", Vol. 1 Statics and Vol. 2 Dynamics, McGraw-Hill International Edition, (1997).

REFERENCES
1. Rajasekaran, S, Sankarasubramanian, G., "Fundamentals of Engineering Mechanics", Vikas Publishing House Pvt. Ltd., (2000).
2. Hibbeller, R.C., "Engineering Mechanics", Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., (2000).
3. Palanichamy, M.S., Nagam, S., "Engineering Mechanics – Statics & Dynamics", Tata McGraw-Hill, (2001).
4. Irving H. Shames, "Engineering Mechanics – Statics and Dynamics", IV Edition – Pearson Education Asia Pvt. Ltd., (2003).
5. Ashok Gupta, "Interactive Engineering Mechanics – Statics – A Virtual Tutor (CDROM)", Pearson Education Asia Pvt., Ltd., (2002).

EE2151   **CIRCUIT THEORY**   **L T P C**
                                        3 1 0 4

(Common to EEE, EIE and ICE Branches)

UNIT I   BASIC CIRCUITS ANALYSIS   12
Ohm's Law – Kirchoffs laws – DC and AC Circuits – Resistors in series and parallel circuits – Mesh current and node voltage method of analysis for D.C and A.C. circuits.

UNIT II   NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS   12
Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Novton & Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem.

UNIT III   RESONANCE AND COUPLED CIRCUITS   12
Series and paralled resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

UNIT IV   TRANSIENT RESPONSE FOR DC CIRCUITS   12
Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input.

UNIT V   ANALYSING THREE PHASE CIRCUITS   12
Three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits.

TOTAL :60 PERIODS

TEXT BOOKS
1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis",Tata McGraw Hill publishers, 6th edition, New Delhi, (2002).
2. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis",Tata McGraw Hill, (2007).

REFERENCES
1. Paranjothi SR, "Electric Circuits Analysis," New Age International Ltd., New Delhi, (1996).
2. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, Tata McGraw-Hill, New Delhi (2001).
3. Chakrabati A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, (1999).
4. Charles K. Alexander, Mathew N.O. Sadik, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, (2003).

EC2151   **ELECTRIC CIRCUITS AND ELECTRON DEVICES**   **L T P C**
                                                                  3 1 0 4
(For ECE, CSE, IT and Biomedical Engg. Branches)

UNIT I   CIRCUIT ANALYSIS TECHNIQUES   12
Kirchoff's current and voltage laws – series and parallel connection of independent sources – R, L and C – Network Theorems – Thevenin, Superposition, Norton, Maximum power transfer and duality – Star-delta conversion.

UNIT II   TRANSIENT RESONANCE IN RLC CIRCUITS   12
Basic RL, RC and RLC circuits and their responses to pulse and sinusoidal inputs – frequency response – Parallel and series resonances – Q factor – single tuned and double tuned circuits.

UNIT III   SEMICONDUCTOR DIODES   12
Review of intrinsic & extrinsic semiconductors – Theory of PN junction diode – Energy band structure – current equation – space charge and diffusion capacitances – effect of temperature and breakdown mechanism – Zener diode and its characteristics.

UNIT IV TRANSISTORS 12

Principle of operation of PNP and NPN transistors – study of CE, CB and CC configurations and comparison of their characteristics – Breakdown in transistors – operation and comparison of N-Channel and P-Channel JFET – drain current equation – MOSFET – Enhancement and depletion types – structure and operation – comparison of BJT with MOSFET – thermal effect on MOSFET.

UNIT V SPECIAL SEMICONDUCTOR DEVICES (Qualitative Treatment only) 12

Tunnel diodes – PIN diode, varactor diode – SCR characteristics and two transistor equivalent model – UJT – Diac and Triac – Laser, CCD, Photodiode, Phototransistor, Photoconductive and Photovoltaic cells – LED, LCD.

TOTAL : 60 PERIODS

TEXT BOOKS

1. Joseph A. Edminister, Mahmood, Nahri, "Electric Circuits" – Shaum series,Tata McGraw Hill, (2001)
2. S. Salivahanan, N. Suresh kumar and A. Vallavanraj, "Electronic Devices and Circuits",Tata McGraw Hill, 2nd Edition, (2008).
3. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5th Edition, (2008).

REFERENCES

1. Robert T. Paynter, "Introducing Electronics Devices and Circuits", Pearson Education, 7th Education, (2006).
2. William H. Hayt, J.V. Jack, E. Kemmebly and steven M. Durbin, "Engineering Circuit Analysis",Tata McGraw Hill, 6th Edition, 2002.
3. J. Millman & Halkins, Satyebranta Jit, "Electronic Devices & Circuits",Tata McGraw Hill, 2nd Edition, 2008.

GE2151 **BASIC ELECTRICAL AND ELECTRONICS ENGINEERING** **L T P C**
3 0 0 3

(Common to branches under Civil, Mechanical and Technology faculty)

UNIT I ELECTRICAL CIRCUITS & MEASURMENTS 12

Ohm's Law – Kirchoff's Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase Balanced Circuits.

Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

UNIT II ELECTRICAL MECHANICS 12

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, single phase induction Motor.

UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS 12

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation.

Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics – Elementary Treatment of Small Signal Amplifier.

UNIT IV DIGITAL ELECTRONICS 12

Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion (single concepts)

UNIT V FUNDAMENTALS OF COMMUNICATION ENGINEERING 12

Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations.
Communication Systems: Radio, TV, Fax, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).

TOTAL : 60 PERIODS

TEXT BOOKS
1. V.N. Mittle "Basic Electrical Engineering",Tata McGraw Hill Edition, New Delhi, 1990.
2. R.S. Sedha, "Applied Electronics" S. Chand & Co., 2006.

REFERENCES
1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical, Electronics and Computer Engineering",Tata McGraw Hill, Second Edition, (2006).
2. Nagsarkar T K and Sukhija M S, "Basics of Electrical Engineering", Oxford press (2005).
3. Mehta V K, "Principles of Electronics", S.Chand & Company Ltd, (1994).
4. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, (2002).
5. Premkumar N, "Basic Electrical Engineering", Anuradha Publishers, (2003).

GE2152   **BASIC CIVIL & MECHANICAL ENGINEERING**   **L T P C**
                                                             4 0 0 4

(Common to branches under Electrical and I & C Faculty)

A – CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS 15

Surveying: Objects – types – classification – principles – measurements of distances – angles – leveling – determination of areas – illustrative examples.

Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel sections.

UNIT II BUILDING COMPONENTS AND STRUCTURES 15

Foundations: Types, Bearing capacity – Requirement of good foundations.

Superstructure: Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering – Mechanics – Internal and external forces – stress – strain – elasticity – Types of Bridges and Dams – Basics of Interior Design and Landscaping.

TOTAL : 30 PERIODS

B – MECHANICAL ENGINEERING

UNIT III   POWER PLANT ENGINEERING   10
Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits – Pumps and turbines – working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.

UNIT IV   I C ENGINES   10
Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler as a power plant.

UNIT V   REFRIGERATION AND AIR CONDITIONING SYSTEM   10
Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

TOTAL: 30 PERIODS

REFERENCES
1. Shanmugam G and Palanichamy M S, "Basic Civil and Mechanical Engineering",Tata McGraw Hill Publishing Co., New Delhi, (1996).
2. Ramamrutham. S, "Basic Civil Engineering", Dhanpat Rai Publishing Co. (P) Ltd. (1999).
3. Seetharaman S. "Basic Civil Engineering", Anuradha Agencies, (2005).
4. Venugopal K and Prahu Raja V, "Basic Mechanical Engineering", Anuradha Publishers, Kumbakonam, (2000).
5. Shantha Kumar S R J., "Basic Mechanical Engineering", Hi-tech Publications, Mayiladuthurai, (2000).

GE2155   **COMPUTER PRACTICE LABORATORY – II**   **L T P C**
                                                                     0 1 2 2

LIST OF EXPERIMENTS

1. UNIX COMMANDS   15

 Study of Unix OS - Basic Shell Commands - Unix Editor

2. SHELL PROGRAMMING   15

Simple Shell program - Conditional Statements - Testing and Loops

3. C PROGRAMMING ON UNIX   15

Dynamic Storage Allocation-Pointers-Functions-File Handling

TOTAL : 45 PERIODS

HARDWARE / SOFTWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS

Hardware

- 1 UNIX Clone Server
- 33 Nodes (thin client or PCs)
- Printer – 3 Nos.

Software

- OS – UNIX Clone (33 user license or License free Linux)
- Compiler - C

GS2165   **PHYSICS LABORATORY – II**   **L T P C**
                                                                                                    0 0 3 2

LIST OF EXPERIMENTS

1. Determination of Young's modulus of the material – non uniform bending.
2. Determination of Band Gap of a semiconductor material.
3. Determination of specific resistance of a given coil of wire – Carey Foster   Bridge.
4. Determination of viscosity of liquid – Poiseuille's method.
5. Spectrometer dispersive power of a prism.
6. Determination of Young's modulus of the material – uniform bending.
7. Torsional pendulum – Determination of rigidity modulus.

- **A minimum of FIVE experiments shall be offered.**
- **Laboratory classes on alternate weeks for Physics and Chemistry.**
- **The lab examinations will be held only in the second semester.**

GS2165   **CHEMISTRY LABORATORY – II**   **L T P C**
                                                                                                    0 0 3 2

LIST OF EXPERIMENTS

1. Conduct metric titration (Simple acid base)
2. Conduct metric titration (Mixture of weak and strong acids)
3. Conduct metric titration using $BaCl_2$ vs Na_2SO_4
4. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$)
5. PH titration (acid & base)
6. Determination of water of crystallization of a crystalline salt (Copper   sulphate)
7. Estimation of Ferric iron by spectrophotometry.

- **A minimum of FIVE experiments shall be offered.**
- **Laboratory classes on alternate weeks for Physics and Chemistry.**
- **The lab examinations will be held only in the second semester.**

ME2155   COMPUTER AIDED DRAFTING AND MODELING LABORATORY   L T P C
0 1 2 2

List of Exercises using software capable of Drafting and Modeling

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.

2. Drawing of a Title Block with necessary text and projection symbol.

3. Drawing of curves like parabola, spiral, involute using Bspline or cubic spline.

4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.

5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V-block, Base of a mixie, Simple stool, Objects with hole and curves).

6. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)

7. Drawing of a simple steel truss.

8. Drawing sectional views of prism, pyramid, cylinder, cone, etc,

9. Drawing isometric projection of simple objects.

10. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.

Note: Plotting of drawings must be made for each exercise and attached to the records written by students.

List of Equipments for a batch of 30 students:

1. Pentium IV computer or better hardware, with suitable graphics facility -30 No.
2. Licensed software for Drafting and Modeling. – 30 Licenses
3. Laser Printer or Plotter to print / plot drawings – 2 No.

EE2155   ELECTRICAL CIRCUIT LABORATORY   L T P C
0 0 3 2

(Common to EEE, EIE and ICE)

LIST OF EXPERIMENTS

1. Verification of ohm's laws and kirchoff's laws.
2. Verification of Thevemin's and Norton's Theorem
3. Verification of superposition Theorem
4. Verification of maximum power transfer theorem.

5. Verification of reciprocity theorem
6. Measurement of self inductance of a coil
7. Verification of mesh and nodal analysis.
8. Transient response of RL and RC circuits for DC input.
9. Frequency response of series and parallel resonance circuits.
10. Frequency response of single tuned coupled circuits.

TOTAL: 45 PERIODS

EC2155   **CIRCUITS AND DEVICES LABORATORY**   **L T P C**
                                                                             0 0 3 2

1. Verification of KVL and KCL
2. Verification of Thevenin and Norton Theorems.
3. Verification of superposition Theorem.
4. Verification of Maximum power transfer and reciprocity theorems.
5. Frequency response of series and parallel resonance circuits.
6. Characteristics of PN and Zener diode
7. Characteristics of CE configuration
8. Characteristics of CB configuration
9. Characteristics of UJT and SCR
10. Characteristics of JFET and MOSFET
11. Characteristics of Diac and Triac.
12. Characteristics of Photodiode and Phototransistor.

TOTAL : 45 PERIODS

ENGLISH LANGUAGE LABORATORY (Optional)   **L T P C**
                                                    0 0 2 -

1. Listening: **5**

Listening & answering questions – gap filling – Listening and Note taking- Listening to telephone conversations

2. Speaking: **5**

Pronouncing words & sentences correctly – word stress – Conversation practice.

Classroom Session   **20**

1. Speaking: Introducing oneself, Introducing others, Role play, Debate-   Presentations:
Body language, gestures, postures.
    Group Discussions etc
2. Goal setting – interviews – stress time management – situational reasons

Evaluation

      (1) Lab Session – 40 marks
                Listening   – 10 marks
                Speaking – 10 marks
                Reading   – 10 marks
                Writing   – 10 marks

      (2) Classroom Session – 60 marks

      Role play activities giving real life context – 30 marks
      Presentation   – 30 marks

Note on Evaluation

    1. Examples for role play situations:
    a. Marketing engineer convincing a customer to buy his product.
    b. Telephone conversation – Fixing an official appointment / Enquiry on availability of flight or train tickets / placing an order. etc.

    2. Presentations could be just a Minute (JAM activity) or an Extempore on simple topics or visuals could be provided and students could be asked to talk about it.

REFERENCES

1. Hartley, Peter, Group Communication, London: Routledge, (2004).
2. Doff, Adrian and Christopher Jones, Language in Use – (Intermediate level), Cambridge University Press, (1994).
3. Gammidge, Mick, Speaking Extra – A resource book of multi-level skills activities , Cambridge University Press, (2004).
4. Craven, Miles, Listening Extra - A resource book of multi-level skills activities, Cambridge, Cambridge University Press, (2004).
5. Naterop, Jean & Rod Revell, Telephoning in English, Cambridge University Press, (1987).

LAB REQUIREMENTS

1. Teacher – Console and systems for students
2. English Language Lab Software
3. Tape Recorders.

MA2211   **TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS**   **L T P C**
                                                                              3 1 0 4
                  (Common to all B.E. / B.Tech. Degree Programmes)

OBJECTIVES
The course objective is to develop the skills of the students in the areas of Transforms and Partial Differtial Equations. This will be necessary for their effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory. The course will also serve as a prerequisite for post graduate and specialized studies and research.

UNIT I   **FOURIER SERIES**   **9 + 3**
Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identify – Harmonic Analysis.

UNIT II   FOURIER TRANSFORMS   9 + 3
Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT III   PARTIAL DIFFERENTIAL EQUATIONS   9 +3
Formation of partial differential equations – Lagrange's linear equation – Solutions of standard types of first order partial differential equations - Linear partial differential equations of second and higher order with constant coefficients.

UNIT IV   APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS   9 + 3
Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two-dimensional equation of heat conduction (Insulated edges excluded) – Fourier series solutions in cartesian coordinates.

UNIT V   Z -TRANSFORMS AND DIFFERENCE EQUATIONS   9 + 3
Z-transforms - Elementary properties – Inverse Z-transform – Convolution theorem -Formation of difference equations – Solution of difference equations using Z-transform.

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

TEXT BOOKS
1. Grewal, B.S, "Higher Engineering Mathematic", 40th Edition, Khanna publishers, Delhi, (2007)

REFERENCES
1. Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematic", 7th Edition, Laxmi Publications(P) Ltd. (2007)
2. Ramana.B.V., "Higher Engineering Mathematics", Tata Mc-GrawHill Publishing Company limited, New Delhi (2007).
3. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education (2007).
4. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th edition, Wiley India (2007).

GE2021   ENVIRONMENTAL SCIENCE AND ENGINEERING   L T P C
**   3 0 0 3**
(Common to Civil, CSE, IT & Biomedical Degree Programmes)

AIM
The aim of this course is 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 protection 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.

REFERENCE BOOKS
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)

AG2211   **APPLIED GEOLOGY**   **L T P C**
                                                                    3 0 0 3

OBJECTIVE
At the end of this course the student shall be able to understand about geological formations, classification and morphology of rocks, and the importance of the study of geology for civil engineers with regard to founding structures like dams, bridges, buildings, etc. The student shall also be able to appreciate the importance of geological formation in causing earthquakes and land slides.

UNIT I   GENERAL GEOLOGY   9
Geology in Civil Engineering – Branches of geology – Earth Structures and composition – Elementary knowledge on continental drift and plate technologies. Earth processes – Weathering – Work of rivers, wind and sea and their engineering importance – Earthquake belts in India. Groundwater – Mode of occurrence – prospecting – importance in civil engineering

UNIT II   MINERALOGY   9
Elementary knowledge on symmetry elements of important crystallographic systems – physical properties of minerals – study of the following rock forming minerals – Quartz family. Feldpar family, Augite, Hornblende, Biotite, Muscovite, Calcite, Garnet – properties, behaviour and engineering significance of clay minerals – Fundamentals of process of formation of ore minerals – Coal and petroleum – Their origin and occurrence in India.

UNIT III   PETROLOGY   9
Classification of rocks – distinction between igneous, sedimentary and metamorphic rocks. Description occurrence, engineering properties and distribution of following rocks. Igneous rocks – Granite, Syenite, Diorite, Gabbro, Pegmatite, Dolerite and Basalt Sedimentary rocks sandstone, Limestone, shale conglo, Conglomerate and breccia. Metamorphic rocks. Quartizite, Marble, Slate, Phyllite, Gniess and Schist.

UNIT IV   STRUCTURAL GEOLOGY AND GEOPHYSICAL METHOD   9
Attitude of beds – Outcrops – Introduction to Geological maps – study of structures – Folds, faults and joints – Their bearing on engineering construction. Seismic and Electrical methods for Civil Engineering investigations

UNIT V   GEOLOGICAL INVESTIGATIONS IN CIVIL ENGINEERING   9

Remote sensing techniques – Study of air photos and satellite images – Interpretation for Civil Engineering projects – Geological conditions necessary for construction of Dams, Tunnels, Buildings, Road cuttings, Land slides – Causes and preventions. Sea erosion and coastal protection.

TOTAL: 45 PERIODS

TEXT BOOKS
1.   Parbin Singh, "Engineering and General Geology", Katson Publication House, 1987.
2.   Krynine and Judd, "Engineering Geology and Geotechniques", McGraw-Hill Book Company, 1990

REFERENCES
1.   Legeet, "Geology and Engineering", McGraw-Hill Book Company 1998
2.   Blyth, "Geology for Engineers", ELBS, 1995

CE2201   **MECHANICS OF SOLIDS**   **L T P C**
                                                                                     3 1 0 4

OBJECTIVE
The subject of Mechanics of Solids cuts broadly across all branches of engineering profession. At the end of this course, the student will have knowledge about behaviour of members subjected to various type of forces. The subject can be mastered best by solving numerous problems.

UNIT I   STRESS STRAIN AND DEFORMATION OF SOLIDS, STATES OF STRESS 9+3
Rigid bodies and deformable solids – stability, strength, stiffness – tension, compression and shear stresses – strain, elasticity, Hooke's law, limit of proportionately, modules of elasticity, stress-strain curve, lateral strain – temperature stresses – deformation of simple and compound bars – shear modulus, bulk modulus, relationship between elastic constants – biaxial state of stress – stress at a point – stress on inclined plane – principal stresses and principal planes – Mohr's circle of stresses.

UNIT II   ANALYSIS OF PLANE TRUSS, THIN CYLINDERS / SHELLS   9+3
Stability and equilibrium of plane frames – types of trusses – analysis of forces in truss members method of joints, method of sections, method of tension coefficients – thin cylinders and shells – under internal pressure – deformation of thin cylinders and shells.

UNIT III   TRANSVERSE LOADING ON BEAMS   9+3
Beams – types of supports – simple and fixed, types of load – concentrated, uniformly distributed, varying distributed load, combination of above loading – relationship between bending moment and shear force – bending moment, shear force diagram for simply supported, cantilever and over hanging beams – Theory of simple bending – analysis of stresses – load carrying capacity of beams – proportioning of sections

UNIT IV   DEFLECTION OF BEAMS AND SHEAR STRESSES   9+3
Deflection of beams – double integration method – Macaulay's method – slope and deflection using moment area method, Conjugate Beam method – variation of shear stress – shear stress distribution in rectangular, I sections, solid circular sections, hollow circular sections, angle and channel sections – shear flow – shear centre.

UNIT V   TORSION AND SPRINGS   9+3

Stresses and deformation in circular (solid and hollow shafts) – stepped shafts – shafts fixed at both ends – leaf springs – stresses in helical springs – deflection of springs.

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

TEXT BOOKS
1. Egor P Popov, Engineering Mechanics of Solids, Prentice Hall of India, New Delhi, 2003
2. Bansal R.K. Strength of materials, Laxmi Publications, New Delhi - 2007

REFERENCES
1. Subramanian R., Strength of materials, Oxford university press, New Delhi - 2005
2. William A.Nash, Theory and Problems of Strength of Materials, Schaum's Outline Series, Tata McGraw-Hill publishing co., New Delhi – 2007.
3. Srinath L.S, Advanced Mechanics of Solids, Tata McGraw-Hill Publishing Co., New Delhi, 2003.

CE2202   **MECHANICS OF FLUIDS**   **L T P C**
                                            3 1 0 4

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

UNIT I   DEFINITIONS AND FLUID PROPERTIES   5+2
Definitions – Fluid and fluid mechanics – Dimensions and units – Fluid properties – Continuum Concept of system and control volume

UNIT II   FLUID STATICS & KINEMATICS   10+4
Pascal's Law and Hydrostatic equation – Forces on plane and curved surfaces – Buoyancy – Meta centre – Pressure measurement – Fluid mass under relative equilibrium
Fluid Kinematics
Stream, streak and path lines – Classification of flows – Continuity equation (one, two and three dimensional forms) – Stream and potential functions – flow nets – Velocity measurement (Pilot tube, current meter, Hot wire and hot film anemometer, float technique, Laser Doppler velocimetry)

UNIT III   FLUID DYNAMICS   10+3
Euler and Bernoulli's equations – Application of Bernoulli's equation – Discharge measurement – Laminar flows through pipes and between plates – Hagen Poiseuille equation – Turbulent flow – Darcy-Weisbach formula – Moody diagram – Momentum Principle

UNIT IV   BOUNDARY LAYER AND FLOW THROUGH PIPES   10+3
Definition of boundary layer – Thickness and classification – Displacement and momentum thickness – Development of laminar and turbulent flows in circular pipes – Major and minor losses of flow in pipes – Pipes in series and in parallel – Pipe network

UNIT V   SIMILITUDE AND MODEL STUDY   10+3

Dimensional Analysis – Rayleigh's method, Buckingham's Pi-theorem – Similitude and models – Scale effect and distorted models.

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

TEXT BOOKS
1. Kumar, K.L., "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd., New Delhi, 1995.
2. Garde, R.J. and Mirajgaoker, A.G., "Engineering Fluid Mechanics", Nem Chand Bros., Roorkee
3. Rajput, R.K., "A text book of Fluid Mechanics" , S.Chand and Co.,New Delhi - 2007
4. Fox, Robert, W. and Macdonald, Alan,T., "Introduction to Fluid Mechanics", John Wiley & Sons, 1995
5. Modi, P.N. & Seth, S.M Hydraulics & fluid Mechanics, Standard book house , New Delhi - 2005.

REFERENCES
1. Streeter, Victor, L. and Wylie, Benjamin E., "Fluid Mechanics", McGraw-Hill Ltd., 1998.
2. E. John Finnemore and Joseph B. Franzini, "Fluid Mechanics with Engineering Applications", McGraw-Hill International Edition, 2001.
3. Pernard Messay, "Mechanics of Fluids" 7th Edition, Nelson Thornes Ltd. U. K. 1998.

CE2203   CONSTRUCTION TECHNIQUES, EQUIPMENT AND PRACTICES   L T P C
     4 0 0 4

OBJECTIVE
The main objective of this course is to make the student aware of the various construction techniques, practices and the equipment needed for different types of construction activities. At the end of this course the student shall have a reasonable knowledge about the various construction procedures for sub to super structure and also the equipment needed for construction of various types of structures from foundation to super structure.

UNIT I   CONCRETE TECHNOLOGY   12
Cements – Grade of cements - manufacture of cement – concrete chemicals and Applications – Mix design concept – mix design as per BIS & ACI methods – manufacturing of concrete – Batching – mixing – transporting – placing – compaction of concrete – curing and finishing. Testing of fresh and hardened concrete – quality of concrete - Non – destructive testing.

UNIT II   CONSTRUCTION PRACTICES   13
Specifications, details and sequence of activities and construction co-ordination – Site Clearance – Marking – Earthwork - masonry – stone masonry – Bond in masonry - concrete hollow block masonry – flooring – damp proof courses – construction joints – movement and expansion joints – pre cast pavements – Building foundations – basements – temporary shed – centering and shuttering – slip forms – scaffoldings – de-shuttering forms – Fabrication and erection of steel trusses – frames – braced domes – laying brick –– weather and water proof – roof finishes – acoustic and fire protection.

UNIT III   SUB STRUCTURE CONSTRUCTION   13

Techniques of Box jacking – Pipe Jacking -under water construction of diaphragm walls and basement-Tunneling techniques – Piling techniques - well and caisson - sinking cofferdam - cable anchoring and grouting-driving diaphragm walls, sheet piles - shoring for deep cutting - well points -Dewatering and stand by Plant equipment for underground open excavation.

UNIT IV   SUPER STRUCTURE CONSTRUCTION   12

Launching girders, bridge decks, off shore platforms – special forms for shells - techniques for heavy decks – in-situ pre-stressing in high rise structures, Material handling - erecting light weight components on tall structures - Support structure for heavy Equipment and conveyors - Erection of articulated structures, braced domes and space decks.

UNIT V   CONSTRUCTION EQUIPMENT   10

Selection of equipment for earth work - earth moving operations - types of earthwork equipment - tractors, motor graders, scrapers, front end waders, earth movers – Equipment for foundation and pile driving. Equipment for compaction, batching and mixing and concreting - Equipment for material handling and erection of structures - Equipment for dredging, trenching, tunneling,

TOTAL: 60 PERIODS

TEXT BOOKS
1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment and Methods", 5th Edition, McGraw Hill, Singapore, 1995.
2. Arora S.P. and Bindra S.P., Building Construction, Planning Techniques and Method of Construction, Dhanpat Rai and Sons, 1997.
3. Varghese , P.C. Building construction, Prentice Hall of India Pvt. Ltd, New Delhi, 2007.
4. Sheety, M.S, Concrete Technology, Theory and Practice, S. Chand and Company Ltd, New Delhi, 2005.

REFERENCES
1. Jha J and Sinha S.K., Construction and Foundation Engineering, Khanna Publishers, 1993.
2. Sharma S.C. "Construction Equipment and Management", Khanna Publishers New Delhi, 1988.
3. Deodhar, S.V. "Construction Equipment and Job Planning", Khanna Publishers, New Delhi, 1988.
4. Dr. Mahesh Varma, "Construction Equipment and its Planning and Application", Metropolitan Book Company, New Delhi-, 1983.
5. Gambhir, M.L, Concrete Technology, Tata McGraw – Hill Publishing Company Ltd, New Delhi, 2004

CE2204   **SURVEYING I**   **L T P C**
                                                       3 0 0 3

OBJECTIVE
At the end of the course the student will posses knowledge about Chain surveying, Compass surveying, Plane table surveying, Levelling, Theodolite surveying and Engineering surveys.

UNIT I   INTRODUCTION AND CHAIN SURVEYING   8
Definition - Principles - Classification - Field and office work - Scales - Conventional signs - Survey instruments, their care and adjustment - Ranging and chaining - Reciprocal ranging - Setting perpendiculars - well - conditioned triangles - Traversing - Plotting - Enlarging and reducing figures.

UNIT II   COMPASS SURVEYING AND PLANE TABLE SURVEYING   7

Prismatic compass - Surveyor's compass - Bearing - Systems and conversions - Local attraction - Magnetic declination - Dip - Traversing - Plotting - Adjustment of errors - Plane table instruments and accessories - Merits and demerits - Methods - Radiation - Intersection - Resection - Traversing.

UNIT III   LEVELLING AND APPLICATIONS   12

Level line - Horizontal line - Levels and Staves - Spirit level - Sensitiveness - Bench marks - Temporary and permanent adjustments - Fly and check levelling - Booking - Reduction - Curvature and refraction - Reciprocal levelling - Longitudinal and cross sections - Plotting - Calculation of areas and volumes - Contouring - Methods - Characteristics and uses of contours - Plotting - Earth work volume - Capacity of reservoirs.

UNIT IV   THEODOLITE SURVEYING   8

Theodolite - Vernier and microptic - Description and uses - Temporary and permanent adjustments of vernier transit - Horizontal angles - Vertical angles - Heights and distances - Traversing - Closing error and distribution - Gale's tables - Omitted measurements.

UNIT V   ENGINEERING SURVEYS   10

Reconnaissance, preliminary and location surveys for engineering projects - Lay out - Setting out works - Route Surveys for highways, railways and waterways - Curve ranging - Horizontal and vertical curves - Simple curves - Setting with chain and tapes, tangential angles by theodolite, double theodolite - Compound and reverse curves - Transition curves - Functions and requirements - Setting out by offsets and angles - Vertical curves - Sight distances - Mine Surveying - instruments - Tunnels - Correlation of under ground and surface surveys - Shafts - Adits.

TOTAL: 45 PERIODS

TEXT BOOKS
1. Bannister A. and Raymond S., Surveying, ELBS, Sixth Edition, 1992.
2. Kanetkar T.P., Surveying and Levelling, Vols. I and II, United Book Corporation, Pune, 1994.
3. 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. Heribert Kahmen and Wolfgang Faig, Surveying, Walter de Gruyter, 1995.

CE2207   **SURVEY PRACTICAL I**   **L T P C**
                                                      0 0 4 2

OBJECTIVE
At the end of the course the student will posses knowledge about Survey field techniques
1. Study of chains and its accessories
2. Aligning, Ranging and Chaining
3. Chain Traversing
4. Compass Traversing
5. Plane table surveying: Radiation
6. Plane table surveying: Intersection
7. Plane table surveying: Traversing

8. Plane table surveying: Resection – Three point problem
9. Plane table surveying: Resection – Two point problem
10. Study of levels and levelling staff
11. Fly levelling using Dumpy level
12. Fly levelling using tilting level
13. Check levelling
14. LS and CS
15. Contouring
16. Study of Theodolite

TOTAL: 60 PERIODS

SURVEY PRACTICAL I & SURVEY PRACTICAL II

LIST OF EQUIPMENTS
(For a batch of 30 students)

Sl. No.	Description of Equipments	Quantity
1.	Total Station	3 Nos
2.	Theodolites	Atleast 1 for every 10 students
3.	Dumpy level	Atleast 1 for every 10 students
4.	Plain table	Atleast 1 for every 10 students
5.	Pocket stereoscope	1
6.	Ranging rods	1 for a set of 5 students
7.	Levelling staff	
8.	Cross staff	
9.	Chains	
10.	Tapes	
11.	Arrows	

CE2208   **COMPUTER AIDED BUILDING DRAWING**   **L T P C**
                                                                 0 0 4 2

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

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

TOTAL: 60 PERIODS

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

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

Examination Guideline

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

LIST OF EQUIPMENTS
(For a batch of 30 students)

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

MA2264   **NUMERICAL METHODS**   **L T P C**
3 1 0 4

(Common to Civil, Aero & EEE)

AIM
With the present development of the computer technology, it is necessary to develop efficient algorithms for solving problems in science, engineering and technology. This course gives a complete procedure for solving different kinds of problems occur in engineering numerically.

OBJECTIVES
At the end of the course, the students would be acquainted with the basic concepts in numerical methods and their uses are summarized as follows:

- The roots of nonlinear (algebraic or transcendental) equations, solutions of large system of linear equations and eigen value problem of a matrix can be obtained numerically where analytical methods fail to give solution.
- When huge amounts of experimental data are involved, the methods discussed on interpolation will be useful in constructing approximate polynomial to represent the data and to find the intermediate values.
- The numerical differentiation and integration find application when the function in the analytical form is too complicated or the huge amounts of data are given such as series of measurements, observations or some other empirical information.
- Since many physical laws are couched in terms of rate of change of one/two or more independent variables, most of the engineering problems are characterized in the form of either nonlinear ordinary differential equations or partial differential equations. The methods introduced in the solution of ordinary differential equations and partial differential equations will be useful in attempting any engineering problem.

UNIT I   SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS   9+3
Solution of equation –Fixed point iteration: x=g(x) method - Newton's method – Solution of linear system by Gaussian elimination and Gauss-Jordon method– Iterative method - Gauss-Seidel method - Inverse of a matrix by Gauss Jordon method – Eigen value of a matrix by power method and by Jacobi method for symmetric matrix.

UNIT II   INTERPOLATION AND APPROXIMATION   9+3
Lagrangian Polynomials – Divided differences – Interpolating with a cubic spline – Newton's forward and backward difference formulas.

UNIT III   NUMERICAL DIFFERENTIATION AND INTEGRATION   9+3
Differentiation using interpolation formulae –Numerical integration by trapezoidal and Simpson's 1/3 and 3/8 rules – Romberg's method – Two and Three point Gaussian quadrature formulae – Double integrals using trapezoidal and Simpsons's rules.

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

UNIT V   BOUNDARY   VALUE   PROBLEMS   IN   ORDINARY   AND   PARTIAL   DIFFERENTIAL EQUATIONS   9+3
Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace and Poisson equations.

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

TEXT BOOKS
1.   Veerarjan, T and Ramachandran, T., "Numerical methods with programming in C", Second Editiion, Tata McGraw-Hill Publishing.Co.Ltd, 2007.
2.   Sankara Rao K, "Numerical Methods for Scientisits and Engineers", 3rd Edition, Printice Hall of India Private Ltd, New Delhi, 2007.

REFERENCE BOOKS
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.   Grewal, B.S. and Grewal,J.S., " Numerical methods in Engineering and Science", 6th Edition, Khanna Publishers, New Delhi, 2004.

CE2251   **SOIL MECHANICS**   **L T P C**
                                                                3 0 0 3

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

UNIT I   INTRODUCTION   10
Nature of Soil - Problems with soil - phase relation - sieve analysis - sedimentation analysis – Atterberg limits - classification for engineering purposes - BIS Classification system - Soil compaction - factors affecting compaction – field compaction methods and monitoring.

UNIT II   SOIL WATER AND WATER FLOW   8

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

UNIT III   STRESS DISTRIBUTION, COMPRESSIBILITY AND SETTLEMENT   10

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

UNIT IV   SHEAR STRENGTH   9

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

UNIT V   SLOPE STABILITY   8

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

TOTAL: 45 PERIODS

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

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

CE2252   **STRENGTH OF MATERIALS**   **LT P C**
                                                                            3 1 0 4

OBJECTIVE

This subject is useful for a detailed study of forces and their effects along with some suitable protective measures for the safe working condition. This knowledge is very essential for an engineer to enable him in designing all types of structures and machines.

UNIT I   ENERGY PRINCIPLES   9+3

Strain energy and strain energy density – strain energy in traction, shear in flexure and torsion – castigliano's theorems – principle of virtual work – application of energy theorems for computing deflections in beams and trusses – Maxwell's reciprocal theorems

UNIT II   INDETERMINATE BEAMS   9+3

Propped cantilever and fixed beams-fixed end moments and reactions for concentrated load (central, non central), uniformly distributed load, triangular load (maximum at centre and maximum at end) – theorem of three moments – analysis of continuous beams – shear force and bending moment diagrams for continuous beams – slope & deflections in continuous beams (qualitative study only)

UNIT III   COLUMNS   9+3

Eccentrically loaded short columns – middle third rule – core section – columns of unsymmetrical sections – (angle channel sections) – Euler's theory of long columns – critical loads for prismatic columns with different end conditions; Rankine-Gordon formula for eccentrically loaded columns – thick cylinders – compound cylinders.

UNIT IV   STATE OF STRESS IN THREE DIMENSIONS   9+3

Spherical and deviatory components of stress tensor - determination of principal stresses and principal planes – volumetric strain – dilatation and distortion – theories of failure – principal stress dilatation – principal strain – shear stress – strain energy and distortion energy theories – application in analysis of stress, load carrying capacity and design of members – residual stresses

UNIT V   ADVANCED TOPICS IN BENDING OF BEAMS   9+3

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections – curved beams – Winkler Bach formula – stress concentration – fatigue and fracture.

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

TEXT BOOKS
1.   Egor P Popov, "Engineering Mechanics of Solids", Prentice Hall of India, New Delhi, 2003
2.   Rajput R.K. Strength of Materials, S.Chand&company Ltd., New Delhi - 2006

REFERENCES
1.   Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 2003
2.   William A .Nash, "Theory and Problems of Strength of Materials", Schaum's Outline Series, Tata McGraw Hill Publishing company Ltd, 2007.
3.   Srinath, L.S. Advanced mechanics and solids, Tata-McGraw Hill publishing company ltd, 2005.
4.   Punmia B.C.Theory of Structures (SMTS) Vol 1&II, Laxmi publishing Pvt Ltd,New Delhi ,2004.

CE2253   **APPLIED HYDRAULIC ENGINEERING**   **L T P C**
                                                                                   3 1 0 4

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

UNIT I   OPEN CHANNEL FLOW   9+3
Open channel flow – Types and regimes of flow – Velocity distribution in open channel – Wide open channel – Specific energy – Critical flow and its computation – channel transition.

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

UNIT III   VARIED FLOW   9+3
Dynamic equations of gradually varied flow – Assumptions – Characteristics of flow profiles – Draw down and back water curves – Profile determination – Graphical integration, direct step and standard step method – Flow through transitions - Hydraulic jump – Types – Energy dissipation – Surges.

UNIT IV   PUMPS   9+3
Centrifugal pump - minimum speed to start the pump – multistage Pumps – Jet and submersible pumps - Positive displacement pumps - reciprocating pump - negative slip - flow separation conditions - air vessels -indicator diagram and its variation - savings in work done - rotary pumps.

UNIT V   TURBINES   10+3
Turbines - draft tube and cavitations – Application of momentum principle – Impact of jets on plane and curved plates - turbines - classification - radial flow turbines - axial flow turbines – Impulse and Reaction

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

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

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

CE2254   **SURVEYING II**   **L T P C**
                                                                        3 0 0 3

OBJECTIVE

At the end of the course the student will posses knowledge about Tachometric surveying, Control surveying, Survey adjustments, Astronomical surveying and Photogrametry.

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 accessores - Corrections - Satellite station - Reduction to centre - Trignometric levelling - Single and reciprocal observations - Modern trends – Bench marking

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 - use of Nautical almanac - Star constellations - calculations for azimuth of a line.

UNIT V   HYDROGRAPHIC AND ADVANCE SURVEYING   12

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

TOTAL : 45 PERIODS

TEXT BOOKS

1.   Bannister A. and Raymond S., Surveying, ELBS, Sixth Edition, 1992.
2.   Punmia B.C., Surveying, Vols. I, II and III, Laxmi Publications, 1989.
3.   Kanetkar T.P., Surveying and Levelling, Vols. I and II, United Book Corporation, Pune, 1994.

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.   Heribert Kahmen and Wolfgang Faig, Surveying, Walter de Gruyter, 1995.

CE2255   **HIGHWAY ENGINEERING**   **L T P C**
                                                                          3 0 0 3

OBJECTIVE

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

UNIT I   HIGHWAY PLANNING AND ALIGNMENT   9

History of Road Construction, Highway Development in India - Jayakar Committee Recommendations and Realisations, Twenty-year Road Development Plans, Concepts of On-going Highway Development Programmes at National Level, Institutions for Highway Development at National level - Indian Roads Congress, Highway Research Board, National Highway Authority of India, Ministry of Road Transport and Highways (MORTH) and Central Road Research Institute. Requirements of Ideal Alignment, Factors Controlling Highway Alignment Engineering Surveys for Alignment - Conventional Methods and Modern Methods (Remote Sensing, GIS and GPS techniques) Classification and Cross Section of Urban and Rural Roads (IRC), Highway Cross Sectional Elements – Right of Way, Carriage Way, Camber, Kerbs, Shoulders and Footpaths [IRC Standards], Cross sections of different Class of Roads - Principles of Highway Financing

UNIT II   GEOMETRIC DESIGN OF HIGHWAYS   9

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

UNIT III   FLEXIBLE AND RIGID PAVEMENTS   9

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

UNIT IV   HIGHWAY MATERIALS AND CONSTRUCTION PRACTICE   9

Desirable Properties and Testing of Highway Materials: Soil – California Bearing Ratio Test, Field Density Test - Aggregate - Crushing, Abrasion, Impact Tests, Water absorption, Flakiness and Elongation indices and Stone polishing value test - Bitumen - Penetration, Ductility, Viscosity, Binder content and Softening point Tests. - Construction Practice - Water Bound Macadam Road, Bituminous Road and Cement Concrete Road [as per IRC and MORTH specifications] - Highway Drainage [IRC Recommendations]

UNIT V   HIGHWAY MAINTENANCE   9

Types of defects in Flexible pavements – Surface defects, Cracks, Deformation, Disintegration – Symptoms, Causes and Treatments. - Types of Pavement, Failures in Rigid Pavements – Scaling, Shrinkage, Warping, Structural Cracks Spalling of Joints and Mud Pumping – and Special Repairs. - Pavement Evaluation – Pavement Surface Conditions and Structural Evaluation, Evaluation of pavement Failure and strengthening - Overlay design by Benkelman Beam Method [Procedure only],

                                                                 TOTAL: 45 PERIODS

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

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

CE2257   **STRENGTH OF MATERIALS LABORATORY**   **L T P C**
                                                              0 0 3 2

OBJECTIVE
The experimental work involved in this laboratory should make the student understand the fundamental modes of loading of the structures and also make measurements of loads, displacements and strains. Relating these quantities, the student should be able to obtain the strength of the material and stiffness properties of structural elements.

LIST OF EXPERIMENTS

1.   Test involving axial compression to obtain the stress – strain curve
2.   Test involving axial tension to obtain the stress – strain curve and the strength
3.   Test involving torsion to obtain the torque vs. angle of twist and hence the stiffness
4.   Test involving flexure to obtain the load deflection curve and hence the stiffness
5.   Tests on springs
6.   Hardness tests
7.   Shear test
8.   Test for impact resistance
9.   Tests on Cement

The student should learn the use of deflectometer, extensometer, compressometer and strain gauges.

LIST OF EQUIPMENTS
(For a batch of 30 students)

SI. No.	Description of Equipments	Quantity
1.	UTM of minimum 400 KN capacity	1
2.	Torsion testing machine for steel rods	1
3.	Izod impact testing machine	1
4.	Hardness testing machine Rockwell Vicker's (any 2) Brinnel	1 each
5.	Beam deflection test apparatus	1
6.	Extensometer	1
7.	Compressometer	1
8.	Dial gauges	Few
9	Le Chatelier's apparatus	2
10	Vicat's apparatus	2
11	Mortar cube moulds	10

OBJECTIVE
Student should be able to verify the principles studied in theory by conducting the experiments.

LIST OF EXPERIMENTS
1. Determination of co-efficient of discharge for orifice
2. Determination of co-efficient of discharge for notches
3. Determination of co-efficient of discharge for venturimeter
4. Determination of co-efficient of discharge for orifice meter
5. Study of impact of jet on flat plate (normal / inclined)
6. Study of friction losses in pipes
7. Study of minor losses in pipes
8. Study on performance characteristics of Pelton turbine.
9. Study on performance characteristics of Francis turbine
10. Study on performance characteristics of Kaplan turbine
11. Study on performance characteristics of Centrifugal pumps (Constant speed / variable speed)
12. Study on performance characteristics of reciprocating pump.

TOTAL: 45 PERIODS

LIST OF EQUIPMENTS

1.	**Bernoulli's theorem – Verification Apparatus**	-	1 No.
2.	Calculation of Metacentric height		
	water tank	-	1 No.
	Ship model with accessories	-	1 No.
3.	Measurement of velocity		
	Pitot tube assembly	-	1 No.
4.	Flow measurement		
	open channel flow		
	(i) Channel with provision for fixing notches (rectangular, triangular & trapezoidal forms)	-	1 Unit
	(ii) Flume assembly with provisions for conducting experiments on Hydraulic jumps, generation of surges etc.	-	1 Unit
5.	Flow measurement in pipes		
	(i) Venturimeter, U tube manometer fixtures like Valves, collecting tank	-	1 Unit
	(ii) Orifice meter, with all necessary fittings in pipe lines of different diameters	-	1 Unit
	(iii) Calibration of flow through orifice tank with Provisions for fixing orifices of different shapes, collecting tank	-	1 Unit
	(iv) Calibration of flow through mouth piece Tank with provisions for fixing mouth pieces Viz external mouth pieces & internal mouth piece Borda's mouth piece	-	1 Unit

6.	Losses in Pipes		
	Major loss – Friction loss		
	Pipe lengths (min. 3m) of different diameters with		
	Valves and pressure rapping & collecting tank	-	1 Unit
	Minor Losses		
	Pipe line assembly with provisions for having		
	Sudden contractions in diameter, expansions		
	Bends, elbow fitting, etc.	-	1 Unit
7.	Pumps		
	(i) Centrifugal pump assembly with accessories (single stage)	-	1 Unit
	(ii) Centrifugal pump assembly with accessories (multi stage)	-	1 Unit
	(iii) Reciprocating pump assembly with accessories	-	1 Unit
	(iv) Deep well pump assembly set with accessories	-	1 Unit
8.	Turbine		
	(i) Impulse turbine assembly with fittings & accessories	-	1 Unit
	(ii) Francis turbine assembly with fittings & accessories	-	1 Unit
	(iii) Kaplan turbine assembly with fittings & accessories	-	1 Unit

CE2259   **SURVEY PRACTICAL II**   **L T P C**
                                                              0 0 4 2

OBJECTIVE
At the end of the course the student will posses knowledge about Survey field techniques.
1. Study of theodolite
2. Measurement of horizontal angles by reiteration and repetition and vertical angles
3. Theodolite survey traverse
4. Heights and distances - Triangulation - Single plane method.
5. Tacheometry - Tangential system - Stadia system - Subtense system.
6. Setting out works - Foundation marking - Simple curve (right/left-handed) - Transition curve.
7. Field observation for and Calculation of azimuth
8. Field work using Total Station.

TOTAL: 60 PERIODS

CE2301   **IRRIGATION ENGINEERING**   **L T P C**
                                                                 3 0 0 3
OBJECTIVE
At the end of the semester, the student shall understand the need and mode of irrigation. The student also shall know the irrigation management practices of the past, present and future. The structures involved the elementary hydraulic design of different structures and the concepts of maintenance shall also form part. Finally, the student shall be in a position to conceive and plan any type of irrigation project.

UNIT I   INTRODUCTION   9
Irrigation – Need and mode of irrigation – Merits and demerits of irrigation – Crop and crop seasons – consumptive use of water – Duty – Factors affecting duty – Irrigation efficiencies – Planning and Development of irrigation projects.

UNIT II   IRRIGATION METHODS   8
Canal irrigation – Lift irrigation – Tank irrigation – Flooding methods – Merits and demerits – Sprinkler irrigation – Drip irrigation

UNIT III   DIVERSION AND IMPOUNDING STRUCTURES   10
Weirs – elementary profile of a weir – weirs on pervious foundations - Types of impounding structures - Percolation ponds – Tanks, Sluices and Weirs – Gravity dams – Earth dams – Arch dams – Spillways – Factors affecting location and type of dams – Forces on a dam – Hydraulic design of dams.

UNIT IV   CANAL IRRIGATION   10
Alignment of canals – Classification of canals – Canal drops – Hydraulic design of drops – Cross drainage works – Hydraulic design of cross drainage works – Canal Head works – Canal regulators – River Training works.

UNIT V   IRRIGATION WATER MANAGEMENT   8
Need for optimisation of water use – Minimising irrigation water losses – On farm development works - Participatory irrigation management – Water users associations – Changing paradigms in water management – Performance evaluation.

TOTAL: 45 PERIODS

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

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

CE2302   **STRUCTURAL ANALYSIS I**   **L T P C**
                                                                                  3 1 0 4
OBJECTIVE
The members of a structure are subjected to internal forces like axial forces, shearing forces, bending and torsional moments while transferring the loads acting on it. Structural analysis deals with analysing these internal forces in the members of the structures. At the end of this course students will be conversant with classical method of analysis.

UNIT I   DEFLECTION OF DETERMINATE STRUCTURES   12
Principles of virtual work for deflections – Deflections of pin-jointed plane frames and rigid plane frames – Willot diagram - Mohr's correction

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

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

UNIT III   ARCHES   12

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

UNIT IV   SLOPE DEFLECTION METHOD   12

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

UNIT V   MOMENT DISTRIBUTION METHOD   12

Distribution and carry over of moments – Stiffness and carry over factors – Analysis of continuous beams – Plane rigid frames with and without sway – Naylor's simplification.

TOTAL: 60 PERIODS

TEXT BOOKS
1.   Vaidyanadhan, R and Perumal, P, "Comprehensive Structural Analysis – Vol. 1 & Vol. 2", Laxmi Publications, New Delhi, 2003.
2.   L.S. Negi & R.S. Jangid, "Structural Analysis", Tata McGraw-Hill Publications, New Delhi, Sixth Edition, 2003.
3.   Punmia B.C., Theory of Structures (SMTS) Vol II Laxmi Publishing Pvt ltd, New Delhi, 2004.
4.   BhavaiKatti, S.S, Structural Analysis – Vol. 1 & Vol. 2, Vikas Publishing Pvt Ltd., New Delhi, 2008

REFERENCE
1.   Analysis of Indeterminate Structures – C.K. Wang, Tata McGraw-Hill, 1992.

CE2303   RAILWAYS, AIRPORTS AND HARBOUR ENGINEERING   L T P C
                                                                        4 0 0 4
OBJECTIVE
This course imparts the student's knowledge of planning, design, construction and maintenance of railway tracks. The students acquire proficiency in the application of modern techniques such as GIS, GPS and remote sensing in Railway Engineering. The student develops skills on airport planning and design with the prime focus on runway and taxiway geometrics. Students become conversant with the definition, purpose, location and materials of coastal structures such as piers, breakwaters, wharves, jetties, quays and spring fenders. The students acquire knowledge on site reconnaissance for location and planning of harbours.

UNIT I   RAILWAY PLANNING AND DESIGN   12

Role of Indian Railways in National Development – Railways for Urban Transportation – LRT & MRTS - Engineering Surveys for Track Alignment – Obligatory points - Conventional and Modern methods (Remote Sensing, GIS & GPS, EDM and other equipments) - Permanent Way, its Components and their Functions: Rails - Types of Rails, Rail Fastenings, Concept of Gauges, Coning of Wheels, Creeps and kinks -Sleepers – Functions, Materials, Density – Functions, Materials, Ballastless Tracks - Geometric Design of Railway Tracks – Gradients and Grade Compensation, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Horizontal and Vertical Curves.

UNIT II   RAILWAY TRACK CONSTRUCTION, MAINTENANCE AND OPERATION   12

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

UNIT III   AIRPORT PLANNING AND DESIGN   12

Role of Air Transport, Components of Airports - Airport Planning – Air traffic potential, Site Selection, Design of Components, Cost Estimates, Evaluation and Institutional arrangements Runway Design- Orientation, Cross wind Component, Wind rose Diagram (Problems), Geometric Design and Corrections for Gradients (Problems), Drainage - Taxiway Design – Geometric Design Elements, Minimum Separation Distances, Design Speed, Airport Drainage - Airport Zoning - Clear Zone, Approach Zone, Buffer Zone, Turning Zone, Clearance over Highways and Railways

UNIT IV   AIRPORT LAYOUTS, VISUAL AIDS, AND AIR TRAFFIC CONTROL   12

Airport Layouts – Apron, Terminal Building, Hangars, Motor Vehicle Parking Area and Circulation Pattern, Case studies of Airport Layouts - Airport Buildings – Primary functions, Planning Concept, Principles of Passenger Flow, Passenger Facilities - Visual Aids – Runway and Taxiway Markings, Wind Direction Indicators, Runway and Taxiway Lightings - Air Traffic Control – Basic Actions, Air Traffic Control Network - Helipads, Hangars, Service Equipments.

UNIT V   HARBOUR ENGINEERING   12

Definition of Terms - Harbours, Ports, Docks, Tides and Waves, Littoral Drift, Sounding, Area, Depth, Satellite Ports - Requirements and Classification of Harbours - Site Selection & Selection Investigation – Speed of water, Dredging, Range of Tides, Waves and Tidal Currents, Littoral Transport with Erosion and Deposition, Soundings, Anchoring Grounds, Geological Characteristics, Winds & Storms, Position and Size of Shoals - Shore Considerations- Proximity to Towns/Cities, Utilities, Construction Materials, Coast Lines - Dry and Wet Docks, Planning and Layouts - Entrance, Position of Light Houses, Navigating - Terminal Facilities – Port Buildings, Warehouse, Transit Sheds, Inter-modal Transfer Facilities, Mooring Accessories, Navigational Aids - Coastal Structures- Piers, Breakwaters, Wharves, Jetties, Quays, Spring Fenders - Coastal Shipping, Inland Water Transport and Container Transportation.

TOTAL: 60 PERIODS

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

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

CE2304   **ENVIRONMENTAL ENGINEERING – I**   **L T P C**
                                                                          3 0 0 3
OBJECTIVE
To make the students conversant with principles of water supply, treatment and distribution

UNIT I   PLANNING FOR WATERSUPPLY SYSTEM   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 - Water quality - Characterization -Water quality standards.

UNIT II   CONVEYANCE SYSTEM   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 -Drawings appurtenances - Types and capacity of pumps -Selection of pumps and pipe materials.

UNIT III   WATER TREATMENT   9
 Objectives -Unit operations and processes -Principles, functions design and drawing of Flash mixers, fiocculators, sedimentation tanks and sand filters -Disinfection- Residue Management.

UNIT IV   ADVANCED WATER TREATMENT   9
Aerator- Iron and manganese removal, Defluoridation and demineralization -Water softening - Desalination -Membrane Systems -Construction and Operation & Maintenance aspects of Water Treatment Plants -Recent advances -Membrane Processes

UNIT V   WATER DISTRIBUTION AND SUPPLY TO BUILDINGS   9
Requirements of water distribution -Components -Service reservoirs -Functions and drawings - Network design -Economics -Computer applications -Analysis of distribution networks - Appurtenances -operation and maintenance -Leak detection, Methods. 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.1 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 K Jain and Arun K 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.

CE2305   **FOUNDATION ENGINEERING**   **LT P C**
                                                                   3 0 0 3

OBJECTIVE

At the end of this course student acquires the capacity to assess the soil condition at a given location in order to sugest suitable foundation and also gains the knowledge to design various foundations.

UNIT I   SITE INVESTIGATION AND SELECTION OF FOUNDATION   9

Scope and objectives – Methods of exploration-auguring and boring – Water boring and rotatory drilling – Depth of boring – Spacing of bore hole - Sampling – Representative and undisturbed sampling – sampling techniques – Split spoon sampler, Thin tube sampler, Stationary piston sampler – Bore log report – Penetration tests (SPT and SCPT) – Data interpretation (Strength parameters and Liquefaction potential) – Selection of foundation based on soil condition.

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 insitu tests (SPT, SCPT and plate load) – Allowable bearing pressure, Settlement – Components of settlement – Determination of settlement of foundations on granular and clay deposits – Allowable settlements – Codal provision – Methods of minimising settlement, differential settlement.

UNIT III   FOOTINGS AND RAFTS   9

Types of foundation – Contact pressure distribution below footings and raft - Isolated and combined footings – Types and proportioning - Mat foundation– Types, applications uses and proportioning-- floating foundation.

UNIT IV   PILES   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 Hiley's) – Capacity from insitu tests (SPT and SCPT) – Negative skin friction – uplift capacity – Group capacity by different methods (Feld's rule, Converse Labarra formula and block failure criterion) – Settlement of pile groups – Interpretation of pile load test – Forces on pile caps – under reamed 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 - Coloumb's wedge theory – condition for critical failure plane - Earth pressure on retaining walls of simple configurations – Graphical methods (Rebhann and Culmann) - pressure on the wall due to line load – Stability of retaining walls.

                                                                   TOTAL: 45 PERIODS

TEXT BOOKS

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

REFERENCES

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

CE2306   **DESIGN OF RC ELEMENTS**   **L T P C**
                                                                          3 1 0 4

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

UNIT I   METHODS OF DESIGN OF CONCRETE STRUCTURES   12
Concept of Elastic method, ultimate load method and limit state method – Advantages of Limit State Method over other methods – Design codes and specification – Limit State philosophy as detailed in IS code – Design of flexural members and slabs by working stress method – Principles of Design of Liquid retaining structures – Properties of un-cracked section – Calculation of thickness and reinforcement for Liquid retaining structure

UNIT II   LIMIT STATE DESIGN FOR FLEXURE   12
Analysis and design of one way and two way rectangular slab subjected to uniformly distributed load for various boundary conditions and corner effects – Analysis and design of singly and doubly reinforced rectangular and flanged beams

UNIT III   LIMIT STATE DESIGN FOR BOND, ANCHORAGE SHEAR & TORSION   12
Behaviour of RC members in bond and Anchorage - Design requirements as per current code - Behaviour of RC beams in shear and torsion - Design of RC members for combined bending shear and torsion.

UNIT IV   LIMIT STATE DESIGN OF COLUMNS
12
Types of columns – Braced and unbraced columns – Design of short column for axial, uniaxial and biaxial bending – Design of long columns.

UNIT V   LIMIT STATE DESIGN OF FOOTING AND DETAILING   12
Design of wall footing – Design of axially and eccentrically loaded rectangular footing – Design of combined rectangular footing for two columns only – Standard method of detailing RC beams, slabs and columns – Special requirements of detailing with reference to erection process.

                                                            TOTAL: 60 PERIODS
TEXT BOOKS
1.   Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi 2002.
2.   Krishna Raju, N., "Design of Reinforced Concrete Structures", CBS Publishers & Distributors, New Delhi,2003.

REFERENCES
1.   Jain, A.K., "Limit State Design of RC Structures", Nemchand Publications, Rourkee
2.   Sinha, S.N., "Reinforced Concrete Design", Tata McGraw-Hill Publishing Company Ltd., New Delhi.
3.   Unnikrishna Pillai, S., Devdas Menon, "Reinforced Concrete Design", Tata McGraw-Hill Publishing Company Ltd., New Delhi.

GE2321   **COMMUNICATION SKILLS LABORATORY**   **L T P C**
                                       (Fifth / Sixth Semester)   **0 0 4 2**

Globalisation has brought in numerous opportunities for the teeming millions, with more focus on the students' overall capability apart from academic competence. Many students, particularly those from non-English medium schools, find that they are not preferred due to their inadequacy of communication skills and soft skills, despite possessing sound knowledge in their subject area along with technical capability. Keeping in view their pre-employment needs and career requirements, this course on Communication Skills Laboratory will prepare students to adapt themselves with ease to the industry environment, thus rendering them as prospective assets to industries. The course will equip the students with the necessary communication skills that would go a long way in helping them in their profession.

OBJECTIVES
- To equip students of engineering and technology with effective speaking and listening skills in English.
- To help them develop their soft skills and interpersonal skills, which will make the transition from college to workplace smoother and help them excel in their job.
- To enhance the performance of students at Placement Interviews, Group Discussions and other recruitment exercises.

I. PC based session	(Weightage 40%)	24 periods

A. ENGLISH LANGUAGE LAB   (18 Periods)

1. LISTENING COMPREHENSION: (6)

Listening and typing – Listening and sequencing of sentences – Filling in the blanks -Listening and answering questions

2. READING COMPREHENSION: (6)

Filling in the blanks - Close exercises – Vocabulary building - Reading and answering questions.

3. SPEAKING: (6)

Phonetics: Intonation – Ear training - Correct Pronunciation – Sound recognition exercises – Common Errors in English.

Conversations: Face to Face Conversation – Telephone conversation – Role play activities (Students take on roles and engage in conversation)

B. DISCUSSION OF AUDIO-VISUAL MATERIALS   (6 PERIODS)
(Samples are available to learn and practice)

1.   **RESUME / REPORT PREPARATION / LETTER WRITING**   (1)
       Structuring the resume / report - Letter writing / Email Communication - Samples.

2.   **PRESENTATION SKILLS:**   (1)
       Elements of effective presentation – Structure of presentation - Presentation tools – Voice Modulation – Audience analysis - Body language – Video samples

3.   SOFT SKILLS: **(2)**
Time management – Articulateness – Assertiveness – Psychometrics –
Innovation and Creativity - Stress Management & Poise - Video Samples

4.   GROUP DISCUSSION: **(1)**
Why is GD part of selection process? - Structure of GD – Moderator – led and other GDs
- Strategies in GD – Team work - Body Language - Mock GD -Video samples

5.   INTERVIEW SKILLS: **(1)**
Kinds of interviews – Required Key Skills – Corporate culture – Mock interviews-Video
samples.

II. Practice Session   (Weightage – 60%)   36 periods

1.   **Resume / Report Preparation / Letter writing**: Students prepare their   **(3)**
      Own resume and report.
2.   **Presentation Skills:** Students make presentations on given topics.   **(12)**
3.   **Group Discussion**: Students participate in group discussions.   **(9)**
4.   **Interview Skills**: Students participate in Mock Interviews   **(12)**

REFERENCES

1.   Anderson, P.V, **Technical Communication**, Thomson Wadsworth , Sixth
      Edition, New Delhi, 2007.

2.   Prakash, P, **Verbal and Non-Verbal Reasoning**, Macmillan India Ltd., Second
      Edition, New Delhi, 2004.

3.   John Seely, **The Oxford Guide to Writing and Speaking**, Oxford University
       Press, New Delhi, 2004.

4.   Evans, D, **Decisionmaker**, Cambridge University Press, 1997.

5.   Thorpe, E, and Thorpe, S, **Objective English**, Pearson Education,
      Second Edition, New Delhi, 2007.

6.   Turton, N.D and Heaton, J.B, **Dictionary of Common Errors**, Addision Wesley
       Longman Ltd., Indian reprint 1998.

LAB REQUIREMENTS
1.   Teacher console and systems for students.
2.   English Language Lab Software
3.   Career Lab Software

GUIDELINES FOR THE COURSE

GE2321   COMMUNICATION SKILLS LABORATORY

1.   A batch of 60 / 120 students is divided into two groups – one group for the PC- based
      session and the other group for the Class room session.

2.   The English Lab (2 Periods) will be handled by a faculty member of the **English
      Department**. The Career Lab (2 Periods) may be handled by any competent teacher,
      not necessarily from English Department

3. **Record Notebook:** At the end of each session of English Lab, review exercises are given for the students to answer and the computer evaluated sheets are to be compiled as record notebook. Similar exercises for the career lab are to be compiled in the record notebook.

4. **Internal Assessment:** The 15 marks (the other 5 marks for attendance) allotted for the internal assessment will be based on the record notebook compiled by the candidate. 10 marks may be allotted for English Lab component and 5 marks for the Career Lab component.

5. **End semester Examination:** The end-semester examination carries 40% weightage for English Lab and 60% weightage for Career Lab.
   Each candidate will have separate sets of questions assigned by the teacher using the teacher-console enabling PC–based evaluation for the 40% of marks allotted.
   The Career Lab component will be evaluated for a maximum of 60% by a local examiner & an external examiner drafted from other Institutions, similar to any other lab examination conducted by Anna University.

CE2307   **CONCRETE AND HIGHWAY ENGINEERING LAB**   **L T P C**
                                                                              0 0 3 2
OBJECTIVE
To learn the principles and procedures of testing Concrete and Highway materials

I. TESTS ON FRESH CONCRETE
   1. Slump cone test
   2. Flow table
   3. Compaction factor
   4. Vee bee test.

II. TESTS ON HARDENED CONCRETE
   1. Compressive strength - Cube & Cylinder
   2. Flexure test
   3. Modulus Of Elastics

III. TESTS ON BITUMEN
   1. Penetration
   2. Softening Point
   3. Ductility
   4. Viscosity
   5. Elastic Recovery
   6. Storage Stability

IV. TESTS ON AGGREGATES
   1. Stripping
   2. Soundness
   3. Proportioning of Aggregates
   4. Water Absorption

V. TESTS ON BITUMINOUS MIXES
   1. Determination of Binder Content
   2. Marshall Stability and Flow values
   3. Specific Gravity
   4. Density.

(EQUIPMENT REQUIRED FOR A BATCH OF 30 STUDENTS)

SL.NO	DESCRIPTION OF EQUIPMENTS	QUANTITY
1.	Concrete cube moulds	6
2.	Concrete cylinder moulds	3
3.	Concrete Prism moulds	3
4.	Sieves	1set
5.	Concrete Mixer	1
6.	Slump cone	3
7.	Flow table	1
8.	Vibrator	1
9.	Trovels and planers	1 set
10.	UTM – 400 KN capacity	1
11.	Vee Bee Consistometer	1
12.	Aggregate impact testing machine	1
13.	CBR Apparatus	1
14.	Blains Apparatus	1

CE2308   **SOIL MECHANICS LABORATORY**   **L T P C**
                                                            0 0 3 2

OBJECTIVE
At the end of this course, the student acquires the capacity to test the soil to assess its Engineering and Index properties.

1. Grain size distribution - Sieve analysis
2. Grain size distribution - Hydrometer analysis
3. Specific gravity of soil grains
4. Relative density of sands
5. Atterberg limits test
6. Determination of moisture - Density relationship using standard Proctor test.
7. Permeability determination (constant head and falling head methods)
8. Determination of shear strength parameters.
9. Direct shear test on cohesionless soil
10. Unconfined compression test on cohesive soil
11. Triaxial compression test (demonstration only)
12. One dimensional consolidation test (Demonstration only)
13. Field density test (Core cutter and sand replacement methods)

TOTAL: 45 PERIODS

LIST OF EQUIPMENT
(For a batch of 30 students)

SL.NO.	DESCRIPTION OF EQUIPMENTS	QUANTITY
1.	Sieves	2 sets
2.	Hydrometer	2 sets
3.	Liquid and plastic limit apparatus	2 sets
4.	Shinkage limit apparatus	3 sets
5.	Proctor compaction apparatus	2 sets
6.	UTM of minimum of 20KN capacity	1
7.	Direct shear apparatus	1
8.	Thermeometer	2
9.	Field density measuring device	2
10.	Triaxial shear apparatus	1
11.	Three gang consolidation test device	1

MG2351   **PRINCIPLES OF MANAGEMENT**   **L T P C**
(Common to all Branches)   **3 0 0 3**

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

UNIT I OVERVIEW OF MANAGEMENT   9

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

UNIT II PLANNING   9

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

UNIT III ORGANIZING   9
Nature and purpose of organizing - Organization structure - Formal and informal groups / organization - Line and Staff authority - Departmentation - Span of control - Centralization and Decentralization - Delegation of authority - Staffing - Selection and Recruitment - Orientation - Career Development - Career stages – Training - Performance Appraisal.

UNIT IV DIRECTING   9

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

UNIT V   CONTROLLING   9

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

TOTAL : 45 PERIODS

TEXT BOOKS

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

REFERENCES

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

CE2351   **STRUCTURAL ANALYSIS – II**   **L T P C**
                                                                              3 1 0 4

OBJECTIVE

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

UNIT I   FLEXIBILITY METHOD   12

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

UNIT II   STIFFNESS MATRIX METHOD   12

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

UNIT III   FINITE ELEMENT METHOD   12

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

UNIT IV   PLASTIC ANALYSIS OF STRUCTURES   12

Statically indeterminate axial problems – Beams in pure bending – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems

UNIT V   SPACE AND CABLE STRUCTURES   12

Analysis of Space trusses using method of tension coefficients – Beams curved in plan Suspension cables – suspension bridges with two and three hinged stiffening girders

TOTAL: 60 PERIODS

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

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

CE2352   **DESIGN OF STEEL STRUCTURES**   **L T P C**
                                                          3 1 0 4
OBJECTIVE:
This course covers the design of structural steel members subjected to compressive, tensile and bending loads, as per current codal provisions (IS 800 - 2007) including connections. Design of structural systems such as roof trusses, gantry girders are included.

UNIT I   INTRODUCTION   12
Properties of steel – Structural steel sections – Limit State Design Concepts – Loads on Structures – Metal joining methods using rivets, welding, bolting – Design of bolted, riveted and welded joints – Eccentric connections - Efficiency of joints – High Tension bolts

UNIT II   TENSION MEMBERS   8
Types of sections – Net area – Net effective sections for angles and Tee in tension – Design of connections in tension members – Use of lug angles – Design of tension splice – Concept of shear lag

UNIT III   COMPRESSION MEMBERS   16
Types of compression members – Theory of columns – Basis of current codal provision for compression member design – Slenderness ratio – Design of single section and compound section compression members – Design of lacing and battening type columns – Design of column bases – Gusseted base

UNIT IV   BEAMS   12
Design of laterally supported and unsupported beams – Built up beams – Beams subjected to biaxial bending – Design of plate girders riveted and welded – Intermediate and bearing stiffeners – Web splices – Design of beam columns

UNIT V   ROOF TRUSSES AND INDUSTRIAL STRUCTURES   12
Roof trusses – Roof and side coverings – Design loads, design of purlin and elements of truss; end bearing – Design of gantry girder

TUTORIAL: 15 TOTAL: 60 PERIODS

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

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

CE2353   CONSTRUCTION PLANNING & SCHEDULING   L T P C
3 0 0 3

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

UNIT I   CONSTRUCTION PLANNING   6
Basic concepts in the development of construction plans-choice of Technology and Construction method-Defining Work Tasks- Definition- Precedence relationships among activities-Estimating Activity Durations-Estimating Resource Requirements for work activities-coding systems.

UNIT II   SCHEDULING PROCEDURES AND TECHNIQUES   12
Relevance of construction schedules-Bar charts - The critical path method-Calculations for critical path scheduling-Activity float and schedules-Presenting project schedules-Critical path scheduling for Activity-on-node and with leads, Lags and Windows-Calculations for scheduling with leads, lags and windows-Resource oriented scheduling-Scheduling with resource constraints and precedences -Use of Advanced Scheduling Techniques-Scheduling with uncertain durations-Crashing and time/cost trade offs -Improving the Scheduling process – Introduction to application software.

UNIT III   COST CONTROL MONITORING AND ACCOUNTING   11
The cost control problem-The project Budget-Forecasting for Activity cost control - financial accounting systems and cost accounts-Control of project cash flows-Schedule control-Schedule and Budget updates-Relating cost and schedule information.

UNIT IV   QUALITY CONTROL AND SAFETY DURING CONSTRUCTION   8
Quality and safety Concerns in Construction-Organizing for Quality and Safety-Work and Material Specifications-Total Quality control-Quality control by statistical methods -Statistical Quality control with
Sampling by Attributes-Statistical Quality control by Sampling and Variables-Safety.

UNIT V   ORGANIZATION AND USE OF PROJECT INFORMATION   8
Types of project information-Accuracy and Use of Information-Computerized organization and use of Information -Organizing information in databases-relational model of Data bases-Other conceptual Models of Databases-Centralized database Management systems-Databases and application programs-Information transfer and Flow.

TOTAL: 45 PERIODS

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

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

CE2354   **ENVIRONMENTAL ENGINEERING II**   **L T P C**
                                                                          3 0 0 3
OBJECTIVE
To educate the students on the principles and design of Sewage Collection, Conveyance, treatment and disposal.

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 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 system.

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 – Operation and Mintenance 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 of Sewage 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. Wastewater Engineering – Treatment and Reuse, Tata Mc.Graw-Hill Company, New Delhi, 2003.

CE2355   ENVIRONMENTAL AND IRRIGATION ENGINEERING DRAWING   L T P C
                                                                      0 0 4 2

UNIT I   WATER SUPPLY AND TREATMENT   15
Design & Drawing of flash mixer, flocculator, clarifier – Slow sand filter – Rapid sand filter – Infiltration gallery – Intake towers – Service reservoirs – Pumping station – House service connection for water supply and drainage.

UNIT II   SEWAGE TREATMENT & DISPOSAL   15
Design and Drawing of screen chamber - Grit channel - Primary clarifier - Activated sludge process – Aeration tank & oxidation ditch – Trickling filters – Secondary clarifiers – Sludge digester – Sludge drying beds – Waste stabilisation ponds - Septic tanks and disposal arrangements – Manholes.

UNIT III   IMPOUNDING STRUCTURES   10
Gravity dam, Tank Surplus Weir, Tank Sluice with tower road – Drawing showing plan, elevation, half section including foundation details.

UNIT IV   CANAL TRANSMISSION STRUCTURES   10
Aqueducts – Syphon Aqueducts – Super passage – Canal siphon – Canal Drops- Drawing showing plan, elevation and foundation details.

UNIT V   CANAL REGULATION STRUCTURES   10
Canal head works- Canal Regular – Canal escape- Proportional Distributors – Drawing showing detailed plan, elevation and foundation.

                                                            TOTAL: 60 PERIODS

TEXT BOOKS
1. Modi, P.N., "Environmental Engineering I & II", Standard Book House, Delhi – 6
2. Sathyanarayana Murthy "Irrigation Design and Drawing" Published by Mrs L.Banumathi, Tuni east Godavari District. A.P. 1998.
3. Sharma R.K. Irrigation Engineering and Hydraulic Structures Oxford and IBH Publishing co., New Delhi 2002.

REFERENCES
1. Peary, H.S., ROWE, D.R., Tchobanoglous, G., "Environmental Engineering", McGraw-Hill Book Co., New Delhi, 1995.
2. Metcalf & Eddy, "Wastewater Engineering (Treatment and Reuse)", 4th edition, Tata McGraw-Hill, New Delhi, 2003.
3. Garg S.K., "Irrigation Environmental Engineering and design Structuresl", Khanna Publishers, New Delhi, 17th Reprint, 2003.
4. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 1999
5. Manual on Sewerage and Sewage Treatment, CPHEEO, Government of India, New Delhi, 1993.

CE2356   **ENVIRONMENTAL ENGINEERING LABORATORY**   **L T P C**
                                                                0 0 3 2

OBJECTIVE:
This subject includes the list of experiments to be conducted for characterisation of water and municipal sewage. At the end of the course, the student is expected to be aware of the procedure for quantifying quality parameters for water and sewage.

LIST OF EXPERIMENTS

1. Sampling and preservation methods and significance of characterisation of water and wastewater.
2. Determination of
   i) P^H and turbidity
   ii) Hardness
3. Determination of iron & fluoride
4. Determination of residual chlorine
5. Determination of Chlorides
6. Determination of Ammonia Nitrogen
7. Determination of Sulphate
8. Determination of Optimum Coagulant Dosage
9. Determination of available Chlorine in Bleaching powder
10. Determination of dissolved oxygen
11. Determination of suspended, volatile and fixed solids
12. B.O.D. test
13. C.O.D. test
14. Introduction to Bacteriological Analysis (Demonstration only)

TOTAL: 45 PERIODS

REFERENCES
1. Standard methods for the examination of water and wastewater, APHA, 20th Edition, Washington, 1998
2. Garg, S.K., "Environmental Engineering Vol. I & II", Khanna Publishers, New Delhi
3. Modi, P.N., "Environmental Engineering Vol. I & II", Standard Book House, Delhi-6

LIST OF EQUIPMENTS
                    (For a batch of 30 students)

1.	P^H meter	-	1 no.
2.	Turbidity meter	-	1 no.
3.	Conductivity meter	-	1 No.
4.	Refrigerator	-	1 No.
5.	BOD incubator	-	1 No.
6.	Muffle furnace	-	1 No.
7.	Hot air oven	-	1 No.
8.	Magnetic stirrer with hot plates	-	5 Nos.
9.	Desicator	-	1 No.
10.	Jar test apparatus	-	1 No.
11.	Water bath	-	1 No.
12.	Furniture	-	1 lot
13.	Glass waves / Cruicibles	-	1 lot

14.	Chemicals	-	1 lot
15.	COD apparatus	-	1 No.
16.	Kjeldane apparatus	-	1 No.
17.	Heating mantles	-	5 Nos.
18.	Calorimeter	-	1 No.
19.	Chlorine comparator	-	1 No.
20.	Furniture : Work table	-	10 Nos.
21.	Beaker	-	30 Nos.
22.	Standard flask	-	30 Nos.
23.	Burette with stand	-	15 Nos.
24.	Pipette	-	15 Nos.
25.	Crucible	-	15 Nos.
26.	Filtration assembly	-	1 No.
27.	Chemicals	-	Lot

CE 2357 **SURVEY CAMP** **L T P C**
0 0 0 3

Ten days survey camp using Theodolite, cross staff, levelling staff, tapes, plane table and total station. The camp must involve work on a large area of not less than 400 hectares. At the end of the camp, each student shall have mapped and contoured the area. The camp record shall include all original field observations, calculations and plots.

(i) Triangulation
(ii) Trilateration
(iii) Sun / Star observation to determine azimuth
(iv) Use of GTS to determine latitude and longitude

EVALUATION PROCEDURE

1. Internal Marks : 20 marks
    (decided by the staff in-charge appointed by the Institution)

2. Evaluation of Survey Camp Report : 30 marks
    (Evaluated by the external examiner appointed the University)

3. Viva voce examination : 50 marks
    (evaluated by the internal examiner appointed by the HOD
    with the approval of HOI and external examiner appointed by
    the University – with equal Weightage)

TOTAL: 100 MARKS

CE2401   **DESIGN OF REINFORCED CONCRETE & BRICK MASONRY STRUCTURES**

L T P C
3 1 0 4

OBJECTIVE:
This course covers the design of Reinforced Concrete Structures such as Retaining Wall, Water Tanks, Staircases, Flat slabs and Principles of design pertaining to Box culverts, Mat foundation and Bridges. At the end of the course student has a comprehensive design knowledge related to structures, systems that are likely to be encountered in professional practice.

UNIT I   **RETAINING WALLS**   **12**
Design of cantilever and counter fort retaining walls

UNIT II   **WATER TANKS**   **12**
Underground rectangular tanks – Domes – Overhead circular and rectangular tanks – Design of staging and foundations

UNIT III   **SELECTED TOPICS**   **12**
Design of staircases (ordinary and doglegged) – Design of flat slabs – Design of Reinforced concrete walls – Principles of design of mat foundation, box culvert and road bridges

UNIT IV   **YIELD LINE THEORY**   **12**
Application of virtual work method to square, rectangular, circular and triangular slabs

UNIT V   **BRICK MASONRY**   **12**
Introduction, Classification of walls, Lateral supports and stability, effective height of wall and columns, effective length of walls, design loads, load dispersion, permissible stresses, design of axially and eccentrically loaded brick walls

TUTORIAL: 15 TOTAL: 60 PERIODS

TEXT BOOKS
1. Krishna Raju, N., "Design of RC Structures", CBS Publishers and Distributors, Delhi, 2006
2. Dayaratnam, P., "Brick and Reinforced Brick Structures", Oxford & IBH Publishing House, 1997
3. Varghese, P.C., "Limit State Design of Reinforced Concrete Structures "Prentice hall of India Pvt Ltd New Delhi, 2007.

REFERENCES
1. Mallick, D.K. and Gupta A.P., "Reinforced Concrete", Oxford and IBH Publishing Company
2. Syal, I.C. and Goel, A.K., "Reinforced Concrete Structures", A.H. Wheelers & Co. Pvt. Ltd., 1994
3. Ram Chandra.N. and Virendra Gehlot, "Limit State Design", Standard Book House.2004.

CE 2402   **ESTIMATION AND QUANTITY SURVEYING**   **L T P C**
                                                                              3 0 0 3

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

UNIT I   ESTIMATE OF BUILDINGS   11
Load bearing and framed structures – Calculation of quantities of brick work, RCC, PCC, Plastering, white washing, colour washing and painting / varnishing for shops, rooms, residential building with flat and pitched roof – Various types of arches – Calculation of brick work and RCC works in arches – Estimate of joineries for panelled and glazed doors, windows, ventilators, handrails etc.

UNIT II   ESTIMATE OF OTHER STRUCTURES   10
Estimating of septic tank, soak pit – sanitary and water supply installations – water supply pipe line – sewer line – tube well – open well – estimate of bituminous and cement concrete roads – estimate of retaining walls – culverts – estimating of irrigation works – aqueduct, syphon, fall.

UNIT III   SPECIFICATION AND TENDERS   8
Data – Schedule of rates – Analysis of rates – Specifications – sources – Detailed and general specifications – Tenders – Contracts – Types of contracts – Arbitration and legal requirements.

UNIT IV   VALUATION   8
Necessity – Basics of value engineering – Capitalised value – Depreciation – Escalation – Value of building – Calculation of Standard rent – Mortgage – Lease

UNIT V   REPORT PREPARATION   8
Principles for report preparation – report on estimate of residential building – Culvert – Roads – Water supply and sanitary installations – Tube wells – Open wells.

                                                                      TOTAL: 45 PERIODS
TEXT BOOKS
1.   Dutta, B.N., "Estimating and Costing in Civil Engineering", UBS Publishers & Distributors Pvt. Ltd., 2003
2.   Kohli, D.D and Kohli, R.C., "A Text Book of Estimating and Costing (Civil)", S.Chand & Company Ltd., 2004

REFERENCES
1.   PWD Data Book.

CE 2403   **BASICS OF DYNAMICS AND ASEISMIC DESIGN**   **L T P C**
                                                                        3 0 0 3

OBJECTIVE:
The main objective of this course is to introduce to the student the phenomena of earthquakes, the process, measurements and the factors that affect the design of structures in seismic areas. This objective is achieved through imparting rudiments of theory of vibrations necessary to understand and analyse the dynamic forces caused by earthquakes and structures. Further, the student is also taught the codal provisions as well as the aseismic design methodology.

UNIT I   THEORY OF VIBRATIONS   9
Concept of inertia and damping – Types of Damping – Difference between static forces and dynamic excitation – Degrees of freedom – SDOF idealisation – Equations of motion of SDOF system for mass as well as base excitation – Free vibration of SDOF system – Response to harmonic excitation – Impulse and response to unit impulse – Duhamel integral

UNIT II   MULTIPLE DEGREE OF FREEDOM SYSTEM   9
Two degree of freedom system – Normal modes of vibration – Natural frequencies - Mode shapes - Introduction to MDOF systems – Decoupling of equations of motion – Concept of mode superposition (No derivations).

UNIT III   ELEMENTS OF SEISMOLOGY   9
Causes of Earthquake – Geological faults – Tectonic plate theory – Elastic rebound – Epicentre – Hypocentre – Primary, shear and Raleigh waves – Seismogram – Magnitude and intensity of earthquakes – Magnitude and Intensity scales – Spectral Acceleration - Information on some disastrous earthquakes

UNIT IV   RESPONSE OF STRUCTURES TO EARTHQUAKE   9
Response and design spectra – Design earthquake – concept of peak acceleration – Site specific response spectrum – Effect of soil properties and damping – Liquefaction of soils – Importance of ductility – Methods of introducing ductility into RC structures.

UNIT V   DESIGN METHODOLOGY   9
IS 1893, IS 13920 and IS 4326 – Codal provisions – Design as per the codes – Base isolation techniques – Vibration control measures – Important points in mitigating effects of earthquake on structures.

                                                                TOTAL: 45 PERIODS
TEXT BOOKS
1.   Chopra, A.K., "Dynamics of Structures – Theory and Applications to Earthquake Engineering", Second Edition, Pearson Education, 2003.

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

CE 2404   **PRESTRESSED CONCRETE STRUCTURE**   **L T P C**
                                                        3 0 0 3

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

UNIT I   INTRODUCTION – THEORY AND BEHAVIOUR   9
Basic concepts – Advantages – Materials required – Systems and methods of prestressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons – Effect of tendon profile on deflections – Factors influencing deflections – Calculation of deflections – Short term and long term deflections - Losses of prestress – Estimation of crack width

UNIT II   DESIGN CONCEPTS   9
Flexural strength – Simplified procedures as per codes – strain compatibility method – Basic concepts in selection of cross section for bending – stress distribution in end block, Design of anchorage zone reinforcement – Limit state design criteria – Partial prestressing – Applications.

UNIT III   CIRCULAR PRESTRESSING   9
Design of prestressed concrete tanks – Pipes

UNIT IV   COMPOSITE CONSTRUCTION   9
Analysis for stresses – Estimate for deflections – Flexural and shear strength of composite members

UNIT V   PRE-STRESSED CONCRETE BRIDGES   9
General aspects – pretensioned prestressed bridge decks – Post tensioned prestressed bridge decks – Principles of design only.
                                                        TOTAL: 45 PERIODS

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

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

CE 2405   **COMPUTER AIDED DESIGN & DRAFTING LABORATORY**   **L T P C**
                                                                          0 0 4 2

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

1.   Design and drawing of RCC cantilever and counterfort type retaining walls with reinforcement details
2.   Design of solid slab and RCC Tee beam bridges for IRC loading and reinforcement details
3.   Design and drafting of Intz type water tank, Detailing of circular and rectangular water tanks
4.   Design of plate girder bridge – Twin Girder deck type railway bridge – Truss Girder bridges – Detailed Drawings including connections

                                                                          TOTAL: 60 PERIODS
TEXT BOOKS
1. Krishna Raju, "Structural Design & Drawing (Concrete & Steel)", CBS Publishers 2004.
2. Punmia, B.C., Ashok Kumar Jain, Arun Kumar Jain, "Design of steel structures", Lakshmi publications Pvt. Ltd 2003.

REFERENCES
1. Krishnamurthy, D., "Structural Design & Drawing – Vol. II", CBS Publishers & Distributors, Delhi 1992.
2. Krishnamurthy, D., "Structural Design & Drawing – Vol. III Steel Structures", CBS Publishers & Distributors, New Delhi 1992.

                                            EXAMINATION DURATION 4 HOURS

LIST OF EQUIPMENTS
1.	1. Models of Structures	-	1 each.
2.	Computers Pentium IV	-	30 Nos.
3.	Analysis and Design Software - Minimum 5 user License	-	1 No.
4.	Auto CAD Software - Multi user License	-	1 No.

CE 2406   **DESIGN PROJECT**   **L T P C**
                                                                      0 0 4 2

OBJECTIVE
The objective of this course is to impart and improve the design capability of the student. This course conceives purely a design problem in any one of the disciplines of Civil Engineering; e.g., Design of an RC structure, Design of a waste water treatment plant, Design of a foundation system, Design of traffic intersection etc. The design problem can be allotted to either an individual student or a group of students comprising of not more than four. At the end of the course the group should submit a complete report on the design problem consisting of the data given, the design calculations, specifications if any and complete set of drawings which follow the design.

                                                                      TOTAL: 60 PERIODS

EVALUATION PROCEDURE

The method of evaluation will be as follows:

1. Internal Marks   : 20 marks
    (Decided by conducting 3 reviews by the guide appointed by the
    Institution)
2. Evaluation of Project Report   : 30 marks
    (Evaluated by the external examiner appointed the University).
    Every student belonging to the same group gets the same mark
3. Viva voce examination   : 50 marks
    (Evaluated by the internal examiner appointed by the HOD with the
    approval of HOI, external examiner appointed by the University and
    Guide of the course – with equal Weightage)

                                                                                 Total: 100 marks

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

OBJECTIVE

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

UNIT I   BASIC ECONOMICS   7

Definition of economics - nature and scope of economic science - nature and scope of managerial economics - basic terms and concepts - goods - utility - value - wealth - factors of production - land - its peculiarities - labour - economies of large and small scale - consumption - wants - its characteristics and classification - law of diminishing marginal utility - relation between economic decision and technical decision.

UNIT II   DEMAND AND SCHEDULE   8

Demand - demand schedule - demand curve - law of demand - elasticity of demand - types of elasticity - factors determining elasticity - measurement - its significance - supply - supply schedule - supply curve - law of supply - elasticity of supply - time element in the determination of value - market price and normal price - perfect competition - monopoly - monopolistic competition.

UNIT III   ORGANISATION   8

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

UNIT IV   FINANCING   9

Types of financing - Short term borrowing - Long term borrowing - Internal generation of funds - External commercial borrowings - Assistance from government budgeting support and international finance corporations - analysis of financial statement – Balance Sheet - Profit and Loss account - Funds flow statement.

UNIT V COST AND BREAK EVEN ANALYSES 13

Types of costing – traditional costing approach - activity base costing - Fixed Cost – variable cost – marginal cost – cost output relationship in the short run and in long run – pricing practice – full cost pricing – marginal cost pricing – going rate pricing – bid pricing – pricing for a rate of return – appraising project profitability –internal rate of return – pay back period – net present value – cost benefit analysis – feasibility reports – appraisal process – technical feasibility-economic feasibility – financial feasibility. Break even analysis -   basic assumptions – break even chart – managerial uses of break even analysis.

TOTAL: 45 PERIODS

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

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

CE 2453 **PROJECT WORK** **L T P C**
0 0 12 6

OBJECTIVE

The objective of the project work is to enable the students to work in convenient groups of not more than four members in a group on a project involving theoretical and experimental studies related to Civil Engineering. Every Project Work shall have a Guide who is a member of the faculty of Civil Engineering of the college where the student is registered. The hours allotted for this course shall be utilized by the students to receive directions from the Guide, on library reading, laboratory work, computer analysis or field work and also to present in periodical seminars the progress made in the project.

Each student shall finally produce a comprehensive report covering background information, literature Survey, problem statement, Project work details and conclusions.

This experience of project work shall help the student in expanding his / her knowledge base and also provide opportunity to utilise the creative ability and inference capability.

TOTAL: 180 PERIODS

EVALUATION   PROCEDURE
The method of evaluation will be as follows:
1.   Internal Marks : 20 marks
       (decided by conducting 3 reviews by the guide appointed by the
        Institution)
2.   Evaluation of Project Report : 30 marks
       (Evaluated by the external examiner appointed the University).
       Every student belonging to the same group gets the same mark
3.   Viva voce examination : 50 marks
       (evaluated by the internal examiner appointed by the HOD with the
       approval of HOI, external examiner appointed by the University and
       Guide of the course – with equal Weightage)

TOTAL: 100 MARKS

CE 2021   **HYDROLOGY**   **L T P C**
                                                               3 0 0 3

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

UNIT I   PRECIPITATION   9
Hydrologic cycle – Types of precipitation – Forms of precipitation – Measurement of Rainfall – Spatial measurement methods – Temporal measurement methods – Frequency analysis of point rainfall – Intensity, duration, frequency relationship – Probable maximum precipitation.

UNIT II   ABSTRACTION FROM PRECIPITATION   9
Losses from precipitation – Evaporation process – Reservoir evaporation – Infiltration process – Infiltration capacity – Measurement of infiltration – Infiltration indices – Effective rainfall.

UNIT III   HYDROGRAPHS   9
Factors affecting Hydrograph – Baseflow separation – Unit hydrograph – Derivation of unit hydrograph – S curve hydrograph – Unit hydrograph of different deviations - Synthetic Unit Hydrograph

UNIT IV   FLOODS AND FLOOD ROUTING   9
Flood frequency studies – Recurrence interval – Gumbel's method – Flood routing – Reservoir flood routing – Muskingum's Channel Routing – Flood control

UNIT V   GROUND WATER HYDROLOGY   9
Types of aquifers – Darcy's law – Dupuit's assumptions – Confined Aquifer – Unconfined Aquifer – Recuperation test – Transmissibility – Specific capacity – Pumping test – Steady flow analysis only.

                                                    TOTAL: 45 PERIODS
TEXT BOOKS
1.   Subramanya, K., "Engineering Hydrology", Tata McGraw-Hill Publishing Co., Ltd., 2000
2.   Raghunath, H.M., "Hydrology", Wiley Eastern Ltd., 2000

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

CE 2022   **CARTOGRAPHY**   **L T P C**
                                                               3 0 0 3

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

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

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

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

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

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

TOTAL: 45 PERIODS

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

CE 2023   **ELECTRONIC SURVEYING**   **L T P C**
                                                                3 0 0 3

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

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

UNIT II   BASIC ELETRONICS   8
Fundamentals of electronics, resonant circuits, semiconductors, Lasers, Cathode ray tube, photo multiplier tube, transducers, oscillators, frequency mixing, modulation and demodulation, Kerrcell modulator, measurement of phase difference, reflectors and power sources.

UNIT III   PROPAGATION OF ELECTROMAGNETIC WAVES   11
Definition, classification, applications, propagation properties, wave propagation at lower and higher frequencies. Refractive index, factors affecting, computation of group refractive index for light and near infrared waves at standard conditions and ambient conditions, reference refractive index, first velocity correction, computation of refractive index for microwaves, measurement of atmospheric parameters, mean refractive index, real time application of first velocity correction, second velocity correction and total atmospheric correction.

UNIT IV   ELECTROMAGNETIC DISTANCE MEASURING SYSTEM   11
Electro-optical system, measuring principle, working principle, sources of error, infrared EDM instruments, Laser EDM instruments and total station. Microwave system, measuring principle, working principle, sources of error, microwave EDM instruments, comparison with Electro-optical system, care and maintenance of EDM instruments, Modern Positioning Systems. EDM traversing, trilateration and base line measurement using EDM.

UNIT V   FIELD STUDIES   8
Study o different EDM instruments and Total Station. EDM traversing, trilateration and base line measurement using EDM.

TOTAL: 45 PERIODS

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

CE2024   REMOTE SENSING TECHNIQUES 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 softwares – Data type – Spatial and non-spatial (attribute) data – measurement scales – Data Base Management Systems (DBMS).

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

TOTAL: 45 PERIODS

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

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

CE2025   **ARCHITECTURE**   **LT P C**
                                                                  3 0 0 3

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

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

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

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

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

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

TOTAL: 45 PERIODS
REFERENCES
1. Francis D.K. Ching, "Architecture: Form, Space and Order", VNR, N.Y., 1999.
2. Givoni B., "Man Climate and Architecture", Applied Science, Barking ESSEX, 1982
3. Edward D.Mills, "Planning and Architects Handbook", Butterworth London, 1995.
4. Gallian B.Arthur and Simon Eisner, "The Urban Pattern – City Planning and Design", Affiliated Press Pvt. Ltd., New Delhi, 1995.
5. Margaret Robert, "An Introduction to Town Planning Techniques", HutchinsoLondon , 1990.

GE2022   **TOTAL QUALITY MANAGEMENT**   **L T P C**
                                                                             3 0 0 3

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

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

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

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

UNIT V   QUALITY SYSTEMS   9
Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing- QS 9000 – ISO 14000 – Concepts, Requirements and Benefits – Case studies of TQM implementation in manufacturing and service sectors including IT.
                                                                 TOTAL: 45 PERIODS

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

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

GE2023   **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.

GE2025   **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).

GE 2071   INTELLECTUAL PROPERTY RIGHTS (IPR)   L T P C
3 0 0 3

UNIT I   5
Introduction – Invention and Creativity – Intellectual Property (IP) – Importance – Protection of IPR – Basic types of property (i. Movable Property ii. Immovable Property and iii. Intellectual Property).

UNIT II   10
IP – Patents – Copyrights and related rights – Trade Marks and rights arising from Trademark registration – Definitions – Industrial Designs and Integrated circuits – Protection of Geographical Indications at national and International levels – Application Procedures.

UNIT III 10
International convention relating to Intellectual Property – Establishment of WIPO – Mission and Activities – History – General Agreement on Trade and Tariff (GATT).

UNIT IV 10
Indian Position Vs WTO and Strategies – Indian IPR legislations – commitments to WTO-Patent Ordinance and the Bill – Draft of a national Intellectual Property Policy – Present against unfair competition.

UNIT V 10
Case Studies on – Patents (Basumati rice, turmeric, Neem, etc.) – Copyright and related rights – Trade Marks – Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition.

TOTAL : 45 PERIODS

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

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

GE 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, " (1998) Indian Political System ", New Academic Publishing House, Jalaendhar.
3. R.N. Sharma, " Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.
4. Yogendra Singh, " (1997) Social Stratification and Charge in India ", Manohar, New Delhi.

CE 2026   TRAFFIC ENGINEERING AND MANAGEMENT   L T P C
3 0 0 3

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

UNIT I   INTRODUCTION   9
Significance and scope, Characteristics of Vehicles and Road Users, Skid Resistance and Braking Efficiency (Problems), Components of Traffic Engineering- Road, Traffic and Land Use Characteristics

UNIT II   TRAFFIC SURVEYS AND ANALYSIS   9
Surveys and Analysis - Volume, Capacity, Speed and Delays, Origin and Destination, Parking, Pedestrian Studies, Accident Studies and Safety Level of Services- Basic principles of Traffic Flow.

UNIT III   TRAFFIC CONTROL   9
Traffic signs, Road markings, Design of Traffic signals and Signal co-ordination (Problems), Traffic control aids and Street furniture, Street Lighting, Computer applications in Signal design

UNIT IV   GEOMETRIC DESIGN OF INTERSECTIONS   9
Conflicts at Intersections, Classification of 'At Grade Intersections, - Channallised Intersections - Principles of Intersection Design, Elements of Intersection Design, Rotary design, Grade Separation and interchanges - Design principles.

UNIT V   TRAFFIC MANAGEMENT   9
Traffic Management- Transportation System Management (TSM) - Travel Demand Management (TDM), Traffic Forecasting techniques, Restrictions on turning movements, One-way Streets, Traffic Segregation, Traffic Calming, Tidal flow operations, Exclusive Bus Lanes, Introduction to Intelligent Transportation System (ITS).

TOTAL: 45 PERIODS

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

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

CE 2027   **HOUSING PLANNING AND MANAGEMENT**   **L T P C**
                                                                                                        3 0 0 3

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

UNIT I   INTRODUCTION TO HOUSING   9
Definition of Basic Terms – House, Home, Household, Apartments, Multi storeyed Buildings, Special Buildings, Objectives and Strategies of National Housing Policies, Principle of Sustainable Housing, Housing Laws at State level, Bye-laws at Urban and Rural Local Bodies – levels - Development Control Regulations, Institutions for Housing at National, State and Local levels

UNIT II   HOUSING PROGRAMMES   9
Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighborhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes, Role of Public, Private and Non-Government Organizations

UNIT III   PLANNING AND DESIGN OF HOUSING PROJECTS   9
Formulation of Housing Projects – Site Analysis, Layout Design, Design of Housing Units (Design Problems)

UNIT IV   CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS   9
New Constructions Techniques – Cost Effective Modern Construction Materials, Building Centers – Concept, Functions and Performance Evaluation

UNIT V   HOUSING FINANCE AND PROJECT APPRAISAL   9
Appraisal of Housing Projects – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing o f Housing Units, Rents, Recovery Pattern (Problems).

                                                                                TOTAL: 45 PERIODS

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

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

CE 2028   GROUND WATER ENGINEERING   L T P C
3 0 0 3

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

UNIT I   FUNDAMENTALS OF GROUND WATER   9
Introduction – Characteristic of Ground water – Distribution of water - ground water column – Permeability - Darcy's Law - Types of aquifers - Hydrogeological Cycle – water level fluctuations.

UNIT II   HYDRAULICS OF FLOW   9
Storage coefficient - Specific field - Heterogeneity and Anisotrophy -Transmissivity - Governing equations of ground water flow - Steady state flow - Dupuit Forchheimer assumptions - Velocity potential - Flow nets

UNIT III   ESTIMATION OF PARAMETERS   9
Transmissivity and Storativity – Pumping test - Unsteady state flow - Thiess method - Jacob method - Image well theory – Effect of partial penetrations of wells - Collectors wells.

UNIT IV   GROUND WATER DEVELOPMENT   9
Infiltration gallery - Conjunctive use - Artificial recharge Rainwater harvesting - Safe yield -Yield test – Geophysical methods – Selection of pumps.

UNIT V   WATER QUALITY   9
Ground water chemistry - Origin, movement and quality - Water quality standards - Saltwater intrusion –Environmental concern
                                                                TOTAL: 45 PERIODS

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

REFERENCE
1.   C Walton, "Ground Water Resource Evaluation", McGraw-Hill Publications.

CE2029   **MANAGEMENT OF IRRIGATION SYSTEMS**   **L T P C**
                                                                 3 0 0 3

OBJECTIVE

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

UNIT I   IRRIGATION SYSTEM REQUIREMENTS   9

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

UNIT II   IRRIGATION SCHEDULING   8

Time of irrigation – Critical stages of water need of crops – Criteria for scheduling irrigation – Frequency and interval of irrigation.

UNIT III   MANAGEMENT   9

Structural and non-structural strategies in water use and management – Conjunctive use of surface and ground waters – Quality of irrigation water.

UNIT IV   OPERATION   9

Operational plans – Main canals, laterals and field channels – Water control and regulating structures – Performance indicators – Case study

UNIT V   INVOLVEMENT OF STAKE HOLDERS   10

Farmer's participation in System operation – Water user's associations – Farmer councils – Changing paradigms on irrigation management – Participatory irrigation management

TOTAL: 45 PERIODS

TEXT BOOKS

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

REFERENCES

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

CE 2030   **COASTAL ZONE MANAGEMENT**   **L T P C**
                                                         3 0 0 3

OBJECTIVE

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

UNIT I   COASTAL ZONE   9
Coastal zone – Coastal zone regulations – Beach profile – Surf zone – Off shore – Coastal waters – Estuaries – Wet lands and Lagoons – Living resources – Non living resources.

UNIT II   WAVE DYNAMICS   10
Wave classification – Airy's Linear Wave theory – Deep water waves – Shallow water waves – Wave pressure – Wave energy – Wave Decay – Reflection, Refraction and Diffraction of waves – Breaking of waves – Wave force on structures – Vertical – Sloping and stepped barriers – Force on piles.

UNIT III   WAVE FORECASTING AND TIDES   9
Need for forecasting - SMB and PNJ methods of wave forecasting – Classification of tides – Darwin's equilibrium theory of tides – Effects on structures – seiches, Surges and Tsunamis.

UNIT IV   COASTAL PROCESSES   8
Erosion and depositional shore features – Methods of protection – Littoral currents – Coastal aquifers – Sea water intrusion – Impact of sewage disposal in seas.

UNIT V   HARBOURS   9
Structures near coast – Selection of site – Types and selection of break waters – Need and mode of dredging – Selection of dredgers – Effect of Mangalore forest.

TOTAL: 45 PERIODS

TEXT BOOKS
1.   Richard Sylvester, "Coastal Engineering, Volume I and II", Elseiner Scientific Publishing Co., 1999
2.   Quinn, A.D., "Design & Construction of Ports and Marine Structures", McGraw-Hill Book Co., 1999

REFERENCES
1.   Ed. A.T. Ippen, "Coastline Hydrodynamics", McGraw-Hill Inc., New York, 1993
2.   Dwivedi, S.N., Natarajan, R and Ramachandran, S., "Coastal Zone Management in Tamilnadu".

CE 2031   WATER RESOURCES ENGINEERING   L T P C
                                                                  3 0 0 3

OBJECTIVE
The student is exposed to the different phases in Water Resources viz planning, collection of relevant data on water resources and also on National Water Policy. Reservoir planning, management and economic analysis aspects are covered in detail.

UNIT I   GENERAL   9
Water resources survey – Water resources of India and Tamilnadu – Description of water resources planning – Economics of water resources planning, physical and socio economic data – National Water Policy – Collection of meteorological and hydrological data for water resources development.

UNIT II   NETWORK DESIGN   9
Hydrologic measurements – Analysis of hydrologic data – Hydrologic station network – Station network design – Statistical techniques in network design.

UNIT III   WATER RESOURCE NEEDS   9
Consumptive and non-consumptive water use - Estimation of water requirements for irrigation, for drinking and navigation - Water characteristics and quality – Scope and aims of master plan - Concept of basin as a unit for development - Water budget and development plan.

UNIT IV   RESERVOIR PLANNING AND MANAGEMENT   9
Reservoir - Single and multipurpose – Multi objective - Fixation of Storage capacity -Strategies for reservoir operation - Sedimentation of reservoirs - Design flood-levees and flood walls - Channel improvement.

UNIT V   ECONOMIC ANALYSIS   9
Estimation of cost and Evaluation of Benefits - Discount rate - Discounting factors - Discounting techniques – Computer Applications**.**
                                                                    TOTAL: 45 PERIODS

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

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

CE 2032   **PAVEMENT ENGINEERING**   **L T P C**
                                                                      3 0 0 3

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

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

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

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

UNIT IV   PERFORMANCE EVALUATION AND MAINTENANCE   9

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

UNIT V   STABILISATION OF PAVEMENTS   9

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

TOTAL: 45 PERIODS

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

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

CE2033   **GROUND IMPROVEMENT TECHNIQUES**   **L T P C**
                                                       3 0 0 3

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

UNIT I   INTRODUCTION   9

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

UNIT II   DRAINAGE AND DEWATERING   9

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

UNIT III   INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS   9

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

UNIT IV   EARTH REINFORCEMENT   9

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

UNIT V   GROUT TECHNIQUES   9

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

TOTAL: 45 PERIODS

TEXT BOOKS
1. Koerner R.M., "Construction and Geotechnical Methods in Foundation Engineering", McGraw-Hill, 1994.
2. Purushothama Raj, P. "Ground Improvement Techniques", Tata McGraw-Hill Publishing Company, New Delhi, 1995

REFERENCES
1. Moseley M.P., Ground Improvement Blockie Academic and Professional, Chapman and Hall, Glasgow, 1993.
2. Jones J.E.P., Earth Reinforcement and Soil Structure, Butterworths, 1995.
3. Koerner, R.M., "Design with Geosynthetics", (3rd Edition) Prentice Hall, New Jersey, 2002
4. Jewell, R.A., "Soil Reinforcement with Geotextiles", CIRIA special publication, London, 1996
5. Das, B.M., "Principles of Foundation Engineering", Thomson Books / Cole, 2003.

CE 2034   **INTRODUCTION TO SOIL DYNAMICS AND MACHINE FOUNDATIONS**   **L T P C**
       3 0 0 3

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

UNIT I   INTRODUCTION   9
Vibration of elementary systems-vibratory motion-single degree freedom system-free and forced vibration with and without damping

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

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

UNIT IV   DESIGN PROCEDURES   9
Design criteria -dynamic loads - simple design procedures for foundations under reciprocating machines - machines producing impact loads - rotary type machines

UNIT V   VIBRATION ISOLATION   9
Vibration isolation technique-mechanical isolation-foundation isolation-isolation by location-isolation by barriers- active passive isolation tests.

TOTAL: 45 PERIODS

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

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

CE 2035   **ROCK ENGINEERING**   **L T P C**
                                                                3 0 0 3

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

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

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

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

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

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

                                         TOTAL: 45 PERIODS

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

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

CE 2036   ENVIRONMENTAL IMPACT ASSESSMENT OF CIVIL ENGINEERING PROJECTS   L T P C
3 0 0 3

OBJECTIVE
This subject deals with the various impacts of infrastructure projects on the components of environment and method of assessing the impact and mitigating the same.
The student is expected to know about the various impacts of development projects on environment and the mitigating measures.

UNIT I   INTRODUCTION   8
Impact of development projects under Civil Engineering on environment - Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) – EIA capability and limitations – Legal provisions on EIA

UNIT II   METHODOLOGIES   9
Methods of EIA –Check lists – Matrices – Networks – Cost-benefit analysis – Analysis of alternatives

UNIT III   PREDICTION AND ASSESSMENT   9
Assessment of Impact on land, water and air, noise, social, cultural flora and fauna; Mathematical models; public participation – Rapid EIA

UNIT IV   ENVIRONMENTAL MANAGEMENT PLAN   9
Plan for mitigation of adverse impact on environment – options for mitigation of impact on water, air and land, flora and fauna; Addressing the issues related to the Project Affected People – ISO 14000

UNIT V   CASE STUDIES   10
EIA for infrastructure projects – Bridges – Stadium – Highways – Dams – Multi-storey Buildings – Water Supply and Drainage Projects

TOTAL: 45 PERIODS

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

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

CE2037   **INDUSTRIAL WASTE MANAGEMENT**   **L T P C**
                                                                            3 0 0 3

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

UNIT I   INTRODUCTION   8
Types of industries and industrial pollution – Characteristics of industrial wastes – Population
equivalent – Bioassay studies – effects of industrial effluents on streams, sewer, land, sewage
treatment plants and human health – Environmental legislations related to prevention and
control of industrial effluents and hazardous wastes

UNIT II   CLEANER PRODUCTION   8
Waste management Approach – Waste Audit – Volume and strength reduction – Material and
process modifications – Recycle, reuse and byproduct recovery – Applications.

UNIT III   POLLUTION FROM MAJOR INDUSTRIES   9
Sources, Characteristics, waste treatment flow sheets for selected industries such as Textiles,
Tanneries, Pharmaceuticals, Electroplating industries, Dairy, Sugar, Paper, distilleries, Steel
plants, Refineries, fertilizer, thermal power plants – Wastewater reclamation concepts

UNIT IV   TREATMENT TECHNOLOGIES   11
Equalisation – Neutralisation – Removal of suspended and dissolved organic solids - Chemical
oxidation – Adsorption - Removal of dissolved inorganics – Combined treatment of industrial
and municipal wastes – Residue management – Dewatering - Disposal

UNIT V   HAZARDOUS WASTE MANAGEMENT   9
Hazardous wastes - Physico chemical treatment – solidification – incineration – Secure land fills

                                                                    TOTAL: 45 PERIODS

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

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

CE 2038   **AIR POLLUTION MANAGEMENT**   **L T P C**
                                                                                      3 0 0 3

OBJECTIVE

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

UNIT I   SOURCES AND EFFECTS OF AIR POLLUTANTS   9

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

UNIT II   DISPERSION OF POLLUTANTS   9

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

UNIT III   AIR POLLUTION CONTROL   12

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

UNIT IV   AIR QUALITY MANAGEMENT   8

Air quality standards – Air quality monitoring – Preventive measures - Air pollution control efforts – Zoning – Town planning regulation of new industries – Legislation and enforcement – Environmental Impact Assessment and Air quality

UNIT V   NOISE POLLUTION   7

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

TOTAL: 45 PERIODS

TEXT BOOKS
1.   Anjaneyulu, D., "Air Pollution and Control Technologies", Allied Publishers, Mumbai, 2002.
2.   Rao, C.S. Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi, 1996.
3.   Rao M.N., and Rao H. V. N., Air Pollution Control, Tata-McGraw-Hill, New Delhi, 1996.

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

CE 2039 080100078   **MUNICIPAL SOLID WASTE MANAGEMENT**   **L T P C**
                                                                      3 0 0 3

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

UNIT I   SOURCES AND TYPES OF MUNICIPAL SOLID WASTES   9
Sources and types of solid wastes - Quantity – factors affecting generation of solid wastes; characteristics – methods of sampling and characterization; Effects of improper disposal of solid wastes – public health effects. Principle of solid waste management – social & economic aspects; Public awareness; Role of NGOs; Legislation.

UNIT II   ON-SITE STORAGE & PROCESSING   9
On-site storage methods – materials used for containers – on-site segregation of solid wastes – public health & economic aspects of storage – options under Indian conditions – Critical Evaluation of Options.

UNIT III   COLLECTION AND TRANSFER   9
Methods of Collection – types of vehicles – Manpower requirement – collection routes; transfer stations – selection of location, operation & maintenance; options under Indian conditions.

UNIT IV   OFF-SITE PROCESSING   9
Processing techniques and Equipment; Resource recovery from solid wastes – composting, incineration, Pyrolysis - options under Indian conditions.

UNIT V   DISPOSAL   9
Dumping of solid waste; sanitary land fills – site selection, design and operation of sanitary landfills – Leachate collection & treatment
                                                              TOTAL: 45 PERIODS

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

REFERENCES
1.   Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2000
2.   R.E.Landreth and P.A.Rebers, "Municipal Solid Wastes – problems and Solutions", Lewis Publishers, 1997.
3.   Bhide A.D. and Sundaresan, B.B., "Solid Waste Management in Developing Countries", INSDOC, 1993.

CE 2040   **ECOLOGICAL ENGINEERING**   **L T P C**
                                                                                 3 0 0 3

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

UNIT I   PRINCIPLES AND CONCEPTS   9
Scope and applications of Ecological Engineering – Development and evolution of ecosystems – principles and concepts pertaining to species, populations and community

UNIT II   ECOSYSTEM FUNCTIONS   10
Energy flow and nutrient cycling – Food chain and food webs – biological magnification, diversity and stability, immature and mature systems. Primary productivity – Biochemical cycling of nitrogen, phosphorous, sulphur and carbon dioxide; Habitat ecology - Terrestrial, fresh water, estuarine and marine habitats.

UNIT III   ECOLOGICAL ENGINEERING METHODS   9
Bio monitoring and its role in evaluation of aquatic ecosystem; Rehabilitation of ecosystems through ecological principles – step cropping, bio-wind screens, Wetlands, ponds, Root Zone Treatment for wastewater, Reuse of treated wastewater through ecological systems.

UNIT IV   ECOLOGICAL EFFECTS OF INDUSTRIALISATION   9
Ecological effects of exploration, production, extraction, processing, manufacture & transport.

UNIT V   CASE STUDIES   8
Case studies of integrated ecological engineering systems

                                                                   TOTAL: 45 PERIODS

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

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

GE2073   **CONTRACT LAWS AND REGULATIONS**   **L T P C**
                                                                       3 0 0 3

UNIT I   CONSTRUCTION CONTRACTS   9
Indian Contracts Act – Elements of Contracts – Types of Contracts – Features – Suitability – Design of Contract Documents – International Contract Document – Standard Contract Document – Law of Torts

UNIT II   TENDERS   10
Prequalification – Bidding – Accepting – Evaluation of Tender from Technical, Contractual and Commercial Points of View – Contract Formation and Interpretation – Potential Contractual Problems – World Bank Procedures and Guidelines – Transparency in Tenders Act.

UNIT III   ARBITRATION   8
Comparison of Actions and Laws – Agreements – Subject Matter – Violations – Appointment of Arbitrators – Conditions of Arbitration – Powers and Duties of Arbitrator – Rules of Evidence – Enforcement of Award – Costs

UNIT IV   LEGAL REQUIREMENTS   9
Insurance and Bonding – Laws Governing Sale, Purchase and Use of Urban and Rural Land – Land Revenue Codes – Tax Laws – Income Tax, Sales Tax, Excise and Custom Duties and their Influence on Construction Costs – Legal Requirements for Planning – Property Law – Agency Law – Local Government Laws for Approval – Statutory Regulations

UNIT V   LABOUR REGULATIONS   9
Social Security – Welfare Legislation – Laws relating to Wages, Bonus and Industrial Disputes, Labour Administration– Insurance and Safety Regulations – Workmen's Compensation Act – Indian Factory Act – Tamil Nadu Factory Act – Child Labour Act - Other Labour Laws

TOTAL: 45 PERIODS

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

CE 2041   BRIDGE STRUCTURES   L T P C
3 0 0 3

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

UNIT I   INTRODUCTION   9
Design of through type steel highway bridges for IRC loading - Design of stringers, cross girders and main girders - Design of deck type steel highway bridges for IRC loading - Design of main girders

UNIT II   STEEL BRIDGES   9
Design of pratt type truss girder highway bridges - Design of top chord, bottom chord, web members - Effect of repeated loading - Design of plate girder railway bridges for railway loading - Wind effects - Design of web and flange plates - Vertical and horizontal stiffeners.

UNIT III   REINFORCED CONCRETE SLAB BRIDGES   9
Design of solid slab bridges for IRC loading - Design of kerb - Design of tee beam bridges - Design of panel and cantilever for IRC loading

UNIT IV   REINFORCED CONCRETE GIRDER BRIDGES   9
Design of tee beam - Courbon's theory - Pigeaud's curves - Design of balanced cantilever bridges - Deck slab - Main girder - Design of cantilever - Design of articulation.

UNIT V   PRESTRESSED CONCRETE BRIDGES   9

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

TOTAL: 45 PERIODS

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

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

CE 2042   **STORAGE STRUCTURES**   **L T P C**
                                                     3 0 0 3

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

UNIT I   STEEL WATER TANKS   12

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

UNIT II   CONCRETE WATER TANKS   12

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

UNIT III   STEEL BUNKERS AND SILOS   7

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

UNIT IV   CONCRETE BUNKERS AND SILOS   7

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

UNIT V   PRESTRESSED CONCRETE WATER TANKS   7

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

TOTAL: 45 PERIODS

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

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

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

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

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

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

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

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

                                              TOTAL: 45 PERIODS

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

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

CE 2044   **TALL BUILDINGS**   **L T P C**
                                                                      3 0 0 3

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

UNIT I   INTRODUCTION   9

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

UNIT II   THE VERTICAL STRUCTURE PLANE   9

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

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

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

UNIT IV   APPROXIMATE STRUCTURAL ANALYSIS AND DESIGN OF BUILDINGS   9

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

UNIT V   OTHER HIGH-RISE BUILDING STRUCTURE   9

Deep - Beam Systems -High-Rise Suspension Systems - Pneumatic High -Rise Buildings - Space Frame Applied to High - Rise Buildings - Capsule Architecture.

TOTAL: 45 PERIODS

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

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

CE 2045   **PREFABRICATED STRUCTURES**   **L T P C**
                                                                3 0 0 3

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

UNIT I   **INTRODUCTION**   **9**
Need for prefabrication – Principles – Materials – Modular coordination – Standarization – Systems – Production – Transportation – Erection.

UNIT II   **PREFABRICATED COMPONENTS**   **9**
Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls

UNIT III   **DESIGN PRINCIPLES**   **9**
Disuniting of structures- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation.

UNIT IV   **JOINT IN STRUCTURAL MEMBERS**   **9**
Joints for different structural connections – Dimensions and detailing – Design of expansion joints

UNIT V   **DESIGN FOR ABNORMAL LOADS**   **9**
Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse.

                                                       TOTAL: 45 PERIODS

TEXT BOOKS
1.   CBRI, Building materials and components, India, 1990
2.   Gerostiza C.Z., Hendrikson C. and Rehat D.R., Knowledge based process planning for construction and manufacturing, Academic Press Inc., 1994

REFERENCES
1.   Koncz T., Manual of precast concrete construction, Vols. I, II and III, Bauverlag, GMBH, 1971.
2.   Structural design manual, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 1978.

CE 2046   **WIND ENGINEERING**   **L T P C**
                                                               3 0 0 3

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

UNIT I   **INTRODUCTION**   **9**
Terminology – Wind Data – Gust factor and its determination - Wind speed variation with height – Shape factor – Aspect ratio – Drag and lift.

UNIT II   EFFECT OF WIND ON STRUCTURES   9
Static effect – Dynamic effect – Interference effects (concept only) – Rigid structure – Aeroelastic structure (concept only).

UNIT III   EFFECT ON TYPICAL STRUCTURES   9
Tail buildings – Low rise buildings – Roof and cladding – Chimneys, towers and bridges.

UNIT IV   APPLICATION TO DESIGN   9
Design forces on multistorey building, towers and roof trusses.

UNIT V   INTRODUCTION TO WIND TUNNEL   9
Types of models (Principles only) – Basic considerations – Examples of tests and their use.

TOTAL: 45 PERIODS

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

REFERENCES
1.   Devenport A.G., "Wind Loads on Structures", Division of Building Research, Ottowa, 1990.
2.   Wind Force on Structures – Course Notes, Building Technology Centre, Anna University, 1995.

CE 2047   COMPUTER AIDED DESIGN OF STRUCTURE   L T P C
3 0 0 3

OBJECTIVE
The main objective of this programme is to train the student in the use of computers and creating a computer code as well as using commercially available software for the design of Civil Engineering structures.

UNIT I   INTRODUCTION   9
Fundamentals of CAD - Hardware and software requirements -Design process - Applications and benefits.

UNIT II   COMPUTER GRAPHICS   9
Graphic primitives - Transformations -Wire frame modeling and solid modeling -Graphic standards –Drafting packages

UNIT III   STRUCTURAL ANALYSIS   9
Fundamentals of finite element analysis - Principles of structural analysis -Analysis packages and applications.

UNIT IV   DESIGN AND OPTIMISATION   9
Principles of design of steel and RC Structures -Applications to simple design problems – Optimisation techniques - Algorithms - Linear Programming – Simplex method

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, 1993.
2.	Krishnamoorthy C.S.Rajeev S., "Computer Aided Design", Narosa Publishing House, New Delhi, 1993

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

CE 2048   **INDUSTRIAL STRUCTURES**   **L T P C**
                                                                           3 0 0 3
OBJECTIVE
This course deals with some of the special aspects with respect to Civil Engineering structures in industries. At the end of this course the student shall be able to design some of the structures.

UNIT I   PLANNING   9
Classification of Industries and Industrial structures – General requirements for industries like cement, chemical and steel plants – Planning and layout of buildings and components.

UNIT II   FUNCTIONAL REQUIREMENTS   9
Lighting – Ventilation – Acoustics – Fire safety – Guidelines from factories act.

UNIIT III   DESIGN OF STEEL STRUCTURES   9
Industrial roofs – Crane girders – Mill buildings – Design of Bunkers and Silos

UNIT IV   DESIGN OF R.C. STRUCTURES   9
Silos and bunkers – Chimneys – Principles of folded plates and shell roofs

UNIT V   PREFABRICATION   9
Principles of prefabrication – Prestressed precast roof trusses- Functional requirements for Precast concrete units
                                                          TOTAL: 45 PERIODS

TEXT BOOKS
1.	Reinforced Concrete Structural elements – P. Purushothaman.
2.	Pasala Dayaratnam – Design of Steel Structure – 1990.

REFERENCES
1.	Henn W. Buildings for Industry, vols.I and II, London Hill Books, 1995.
2.	Handbook on Functional Requirements of Industrial buildings, SP32 – 1986, Bureau of Indian Standards, New Delhi 1990.
3.	Course Notes on Modern Developments in the Design and Construction of Industrial Structures, Structural Engineering Research Centre, Madras, 1982.
4.	Koncz, J, Manual of Precast Construction Vol I & II Bauverlay GMBH, 1971.

CE 2049   **SMART STRUCTURES AND SMART MATERIALS**   **L T P C**
                                                                  3 0 0 3

OBJECTIVE

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

UNIT I   INTRODUCTION   9
Introduction to Smart Materials and Structures – Instrumented structures functions and response – Sensing systems – Self diagnosis – Signal processing consideration – Actuation systems and effectors.

UNIT II   MEASURING TECHNIQUES   9
Strain Measuring Techniques using Electrical strain gauges, Types – Resistance – Capacitance – Inductance – Wheatstone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain Rosettes.

UNIT III   SENSORS   9
Sensing Technology – Types of Sensors – Physical Measurement using Piezo Electric Strain measurement – Inductively Read Transducers – The LVOT – Fiber optic Techniques.
Chemical and Bio-Chemical sensing in structural Assessment – Absorptive chemical sensors – Spectroscopes – Fibre Optic Chemical Sensing Systems and Distributed measurement.

UNIT IV   ACTUATORS   9
Actuator Techniques – Actuator and actuator materials – Piezoelectric and Electrostrictive Material – Magnetostructure Material – Shape Memory Alloys – Electro orheological Fluids– Electro magnetic actuation – Role of actuators and Actuator Materials.

UNIT V   SIGNAL PROCESSING AND CONTROL SYSTEMS   9
Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors – Signal Processing – Control System – Linear and Non-Linear.

                                                          TOTAL: 45 PERIODS

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

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

CE 2050   **FINITE ELEMENT TECHNIQUES**   **L T P C**
                                                        3 0 0 3
OBJECTIVE

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

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

UNIT II   FINITE ELEMENT ANALYSIS OF ONE DIMENSIONAL PROBLEMS   10

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

UNIT III   FINITE ELEMENT ANALYSIS OF TWO DIMENSIONAL PROBLEMS   10

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

UNIT IV   ISOPARAMETRIC ELEMENTS AND FORMULATION   8

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

UNIT V   APPLICATIONS TO FIELD PROBLEMS IN TWO DIMENSIONALS   8

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

TOTAL: 45 PERIODS

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

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

CE 2071   REPAIR 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   9

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	11
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 FOR REPAIR	9
Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, ferro cement, Fibre reinforced concrete.

## UNIT IV	TECHNIQUES FOR REPAIR AND DEMOLITION	8
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. Engineered demolition techniques for dilapidated structures - case studies.

## UNIT V	REPAIRS, REHABILITATION AND RETROFITTING OF STRUCTURES	8
Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure.

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 Management, Chennai, 1992.
5.	Lakshmipathy, M. etal. Lecture notes of Workshop on "Repairs and Rehabilitation of Structures", 29 - 30th October 1999.s