

St. PETER'S UNIVERSITY

St. Peter's Institute of Higher Education and Research
(Declared under section 3 of UGC Act 1956)
Avadi, Chennai – 600 054.



B.E. (CIVIL ENGINEERING) PROGRAMME

(I TO VIII SEMESTERS)

REGULATIONS AND SYLLABI

REGULATIONS – 2012

(Effective from the Academic Year 2012 - '13)

B.E. (CIVIL ENGINEERING) PROGRAMME

Regulations -2012

Regulations and Syllabi

(Effective from the Academic Year 2012-'2013)

1. Eligibility:

- (1) Candidates who passed the following Examination or any other equivalent Examination thereto and who appeared for the entrance test conducted by the University or approved institutions wherever prescribed are eligible for admission to Four Year B.E. (Civil Engineering) Programme.

Higher Secondary Examination with Mathematics, Physics and Chemistry conducted by the Government of Tamil Nadu or its equivalent in the relevant subjects.

- (2) Candidates who passed Three Year Diploma in Technical Education in the concerned subject conducted by the Government of Tamil Nadu are eligible for admission to Second Year of Four Year B.E. (Civil Engineering) Programme.

- 2. Duration:** Four Years comprising 8 Semesters. Each semester has a minimum 90 working days with a minimum of 5 hours a day.

- 3. Medium:** English is the medium of instruction and examination.

- 4. Weightage for Continuous and End Assessment:** The weightage for Continuous Assessment (CA) and End Assessment (EA) be 25:75 unless the ratio is specifically mentioned in the scheme of Examinations.

- 5. Credit System:** Credit system be followed with 18 credits for each semester and each credit is equivalent to 25 hours of effective study provided in the Time Table.

6. Scheme of Examinations

I Semester

Code No.	Course Title	Credit	Marks		
			CA	EA	Total
Theory					
112EHT01	Technical English – I	1	25	75	100
112MAT02	Mathematics – I	3	25	75	100
112PHT03	Engineering Physics – I	3	25	75	100
112CYT04	Engineering Chemistry – I	3	25	75	100
112EGT05	Engineering Graphics – I	3	25	75	100
112FCT06	Fundamentals of Computing – I	3	25	75	100
Practical					
112CLP01	Computer Practices Laboratory – I	1	25	75	100
112ELP02	Engineering Practices Laboratory – I	1	25	75	100
	Total	18	200	600	800

II Semester

Code No.	Course Title	Credit	Marks		
			CA	EA	Total
Theory					
212EHT01	Technical English – II	2	25	75	100
212MAT02	Mathematics – II	3	25	75	100
212PHT03	Engineering Physics – II	2	25	75	100
212CYT04	Engineering Chemistry – II	2	25	75	100
212EMT05	Engineering Mechanics	3	25	75	100
212EET06	Basic Electrical & Electronics Engineering	3	25	75	100
Practical					
212CLP01	Computer Practices Laboratory – II	1	25	75	100
212ELP02	Physics & Chemistry Laboratory – II	1	25	75	100
212DMP03	Computer Aided Drafting and Modelling Laboratory	1	25	75	100
Total		18	225	675	900

III Semester

Code No.	Course Title	Credit	Marks		
			CA	EA	Total
Theory					
312CET01	Transforms and Partial Differential Equations	3	25	75	100
312CET02	Environmental Science and Engineering	2	25	75	100
312CET03	Applied Geology	2	25	75	100
312CET04	Mechanics of Solids	3	25	75	100
312CET05	Mechanics of Fluids	2	25	75	100
312CET06	Construction Techniques, Equipment and Practice	2	25	75	100
312CET07	Surveying– I	2	25	75	100
Practical					
312CEP01	Survey Practical – I	1	25	75	100
312CEP02	Computer Aided Building Drawing	1	25	75	100
Total		18	225	675	900

IV Semester

Code No.	Course Title	Credit	Marks		
			CA	EA	Total
Theory					
412CET01	Numerical Methods	3	25	75	100
412CET02	Soil Mechanics	2	25	75	100
412CET03	Strength of Materials	3	25	75	100
412CET04	Applied Hydraulic Engineering	3	25	75	100
412CET05	Surveying – II	2	25	75	100
412CET06	Highway Engineering	2	25	75	100
Practical					
412CEP01	Strength of Materials Lab	1	25	75	100
412CEP02	Hydraulic Engineering Laboratory	1	25	75	100
412CEP03	Survey Practical – II	1	25	75	100
Total		18	225	675	900

V Semester

Code No.	Course Title	Credit (marks)	Marks		
			CA	EA	Total
Theory					
512CET01	Irrigation Engineering	2	25	75	100
512CET02	Structural Analysis I	3	25	75	100
512CET03	Railways, Airport and Harbour Engineering	2	25	75	100
512CET04	Environmental Engineering I	3	25	75	100
512CET05	Foundation Engineering	3	25	75	100
512CET06	Design of RC Elements	3	25	75	100
Practical					
512CEP01	Concrete and Highway Engineering Lab	1	25	75	100
512CEP02	Soil Mechanics Laboratory	1	25	75	100
Total		18	200	600	800

VI Semester

Code No.	Course Title	Credit (marks)	Marks		
			CA	EA	Total
Theory					
612CET01	Principles of Management	2	25	75	100
612CET02	Structural Analysis - II	3	25	75	100
612CET03	Design of Steel Structures	3	25	75	100
612CET04	Construction Planning & Scheduling	2	25	75	100
612CET05	Environmental Engineering II	3	25	75	100
612CET09	Elective - I : Remote Sensing Techniques and GIS	2	25	75	100
Practical					
612CEP01	Environmental and Irrigation Engineering Drawing	1	25	75	100
612CEP02	Environmental Engineering Laboratory	1	25	75	100
612CEP03	Survey Camp	1	25	75	100
Total		18	225	675	900

VII Semester

Code No.	Course Title	Credit (marks)	Marks		
			CA	EA	Total
Theory					
712CET01	Design of RC and Brick Masonry Structures	3	25	75	100
712CET02	Estimation and Quantity Surveying	3	25	75	100
712CET03	Basics of Dynamics and Aseismic Design	3	25	75	100
712CET04	Prestressed Concrete Structures	3	25	75	100
712CET05	Elective – II :Traffic Engineering Management	2	25	75	100
712CET12	Elective – III :Ground Improvement Techniques	2	25	75	100
Practical					
712CEP01	Computer Aided Design and Drafting Laboratory	1	25	75	100
712CEP02	Design Project	1	25	75	100
Total		18	200	600	800

VIII Semester

Code No.	Course Title	Credit (marks)	Marks		
			CA	EA	Total
Theory					
812CET01	Engineering Economics and Cost Analysis	3	25	75	100
812CET12	Elective – IV : Repair and Rehabilitation of Structures	3	25	75	100
812CET05	Elective – V : Tall Buildings	3	25	75	100
Practical					
812CEP01	Project Work	9	25	75	100
Total		18	100	300	400

LIST OF ELECTIVE COURSES

Code No.	Course Title	Credit (marks)
Elective – I (Sixth Semester)		
612CET06	Hydrology	2
612CET07	Cartography	2
612CET08	Electronic Surveying	2
612CET09	Remote Sensing Techniques and GIS	2
612CET10	Architecture	2
612CET11	Professional Ethics in Engineering	2
612CET12	Total Quality Management	2
612CET13	Fundamentals of Nanoscience	2
612CET14	Intellectual Property Rights (IPR)	2
612CET15	Indian Constitution and Society	2
612CET16	Disaster Management	2
Elective – II & III (Seventh Semester)		
712CET05	Traffic Engineering Management	2
712CET06	Housing Planning & Management	2
712CET07	Ground Water Engineering	2
712CET08	Management of Irrigation Systems	2
712CET09	Coastal Zone Management	2
712CET10	Water Resources Engineering	2
712CET11	Pavement Engineering	2
712CET12	Ground Improvement Techniques	2
712CET13	Introduction to Soil Dynamics and Machine Foundations	2
712CET14	Rock Engineering	2
712CET15	Environmental Impact Assessment of Civil Engineering Projects	2
712CET16	Industrial Waste Management	2
712CET17	Air Pollution Management	2
712CET18	Municipal Solid Waste and Management	2
712CET19	Ecological Engineering	2
712CET20	Contract Laws and Regulations	2
712CET21	Design And Construction Of Precast Concrete Structures	2
Elective – IV & V (Eighth Semester)		
812CET02	Bridge Structures	3
812CET03	Storage Structures	3
812CET04	Design of Plate and Shell Structures	3
812CET05	Tall Buildings	3
812CET06	Prefabricated structures	3
812CET07	Wind Engineering	3
812CET08	Computer Aided Design of Structures	3
812CET09	Industrial Structures	3
812CET10	Smart Structures and smart Materials	3
812CET11	Finite Element Techniques	3
812CET12	Repair and Rehabilitation of Structures	3

- 7. Passing Requirements:** The minimum pass mark (raw score) be 50% in End Assessment (EA) and 50% in Continuous Assessment (CA) and End Assessment (EA) put together. No minimum mark (raw score) in Continuous Assessment (CA) be prescribed unless it is specifically mentioned in the Scheme of Examination.
- 8. Grading System:** Grading System on a 10 Point Scale be followed with 1 mark = 0.1 Grade point to successful candidates as given below.

CONVERSION TABLE

(1 mark = 0.1 Grade Point on a 10 Point Scale)

Range of Marks	Grade Point	Letter Grade	Classification
90 to 100	9.0 to 10.0	O	First Class
80 to 89	8.0 to 8.9	A	First Class
70 to 79	7.0 to 7.9	B	First Class
60 to 69	6.0 to 6.9	C	First Class
50 to 59	5.0 to 5.9	D	Second Class
0 to 49	0 to 4.9	F	Reappearance

Procedure for Calculation

Cumulative Grade Point Average (CGPA)	=	$\frac{\text{Sum of Weighted Grade Points}}{\text{Total Credits}}$
	=	$\frac{\sum (CA+EA) C}{\sum C}$
Where Weighted Grade Points in each Course	=	Grade Points (CA+EA) multiplied by Credits
	=	(CA+EA)C
Weighted Cumulative Percentage of Marks(WCPM)	=	CGPAx10

C- Credit,

CA-Continuous Assessment,

EA- End Assessment

9. Pattern of the Question Paper: The question paper for End Assessment will be set for three hours and for the maximum of 100 marks with following divisions and details.

Part A: 10 questions (with equal distribution to all units in the syllabus).
Each question carries 2 marks.

Part B: 5 questions with either or type (with equal distribution to all units in the syllabus). Each question carries 16 marks.

The total marks scored by the candidates will be reduced to the maximum prescribed in the Regulations.

10. Effective Period of Operation for the Arrear Candidates :

Two Year grace period is provided for the candidates to complete the arrear examination, if any.

Registrar

11.Syllabus

112EHT01 - TECHNICAL ENGLISH – I

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

General Vocabulary - changing words from one form to another - Adjectives, comparative adjectives - Adverbs - Active and passive voice - Tenses - simple present, present continuous - Adverb forms - Nouns - compound nouns - Skimming and scanning - Listening and transfer of information - bar chart, flowchart - Paragraph writing, description - Discussing as a group and making an oral report on the points discussed, conversation techniques - convincing others.

Suggested activities:

1. Matching words & meanings - Using words in context - Making sentences.
2. Changing sentences from active to passive voice & vice versa.
3. Skimming, cloze exercises, exercises transferring information from text to graphic form - bar charts, flow charts.
4. Writing descriptions using descriptive words & phrases, and technical vocabulary.
5. Role play, conversation exercises, discussions, oral reporting exercises
Any other related relevant classroom activity

UNIT II

Vocabulary - prefixes & suffixes - simple past tense - Spelling and punctuation - 'wh' Question forms - Scanning, inference - Listening & note-taking - Paragraph writing - comparison and contrast - Creative thinking and speaking.

Suggested Activities:

1. a. Vocabulary activities using prefixes and suffixes.
b. Exercises using questions - asking & answering questions.
2. Scanning the text for specific information
3. Listening guided note-taking - Writing paragraphs using notes, giving suitable headings and subheadings for paragraphs. Using expressions of comparison and contrast.
4. Discussion activities and exploring creative ideas.
Any other related relevant classroom activity

UNIT III

Tenses - simple past, simple future and past perfect - Reading in Context -Listening & note-taking - single line - Definitions - sequencing of sentences - instruction - Persuasive speaking.

Suggested activities:

1. a. Providing appropriate context for the use of tenses
2. Listening and note-taking
3. (a) Writing sentence definitions, instructions
(b) Identifying the discourse links and sequencing jumbled sentences / writing instructions.
4. Speaking exercises, discussions, role play exercises using explaining, convincing and persuasive strategies
Any other related relevant classroom activity

UNIT IV

Modal verbs and Probability – Concord subject verb agreement – Correction of errors - Cause and effect expressions – Extended Definition - Speaking about the future plans.

Suggested activities:

1. a. Making sentences using modal verbs to express probability
b. Gap filling using relevant grammatical form of words.
2. Writing extended definitions
3. Speaking - role play activities, discussions, extempore speaking exercises speculating about the future.
Any other related relevant classroom activity

UNIT V

'If' conditionals – Gerunds - Intensive reading - Speaking – Presentation of problems & solutions - Itinerary – planning for an industrial visit - Formal Letter writing – Letter to the editor, invitation letter, accepting, declining letter and permission letter.

Suggested activities:

1. a) Sentence completion exercises using 'If' conditionals.
b) Gap filling exercises using gerunds and present participle forms
2. Reading comprehension exercises.
3. Role play, discussion, debating and speaking activities for stating, discussing
a. problems and suggesting solutions.
4. Planning a tour, Writing a travel itinerary. Writing letters to officials and to the
a. editor in formal/official contexts.
Any other related relevant classroom activity

TEXT BOOK:

1. Department of Humanities & Social Sciences, Anna University, 'English for Engineers and Technologists' Combined Edition (Volumes 1 & 2), Chennai: Orient Longman Pvt. Ltd., 2006. Themes 1 – 4 (Resources, Energy, Computer, Transport)

REFERENCES:

1. Meenakshi Raman and Sangeeta Sharma, 'Technical Communication English skills for Engineers', Oxford University Press, 2008.
2. Andrea, J. Rutherford, 'Basic Communication Skills for Technology', Second Edition, Pearson Education, 2007.

Extensive Reading:

1. A.P.J.Abdul Kalam with Arun Tiwari, 'Wings of Fire' An Autobiography, University Press (India) Pvt. Ltd., 1999, 30th Impression 2007.

NOTE:

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

UNIT I MATRICES

Characteristic equation – Eigen values and eigen vectors of a real matrix – Properties – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic form – Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT II THREE DIMENSIONAL ANALYTICAL GEOMETRY

Equation of a sphere – Plane section of a sphere – Tangent Plane – Equation of a cone – Right circular cone – Equation of a cylinder – Right circular cylinder.

UNIT III DIFFERENTIAL CALCULUS

Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes – Evolute as envelope of normals.

UNIT IV FUNCTIONS OF SEVERAL VARIABLES

Partial derivatives – Euler's theorem for homogenous functions – Total derivatives – Differentiation of implicit functions – Jacobians – Taylor's expansion – Maxima and Minima – Method of Lagrangian multipliers.

UNIT V MULTIPLE INTEGRALS

Double integration
– Cartesian and polar coordinates – Change of order of integration – Change of variables between Cartesian and polar coordinates – Triple integration in Cartesian co-ordinates – Area as double integral – Volume as triple integral

TEXT BOOK:

1. Bali N. P and Manish Goyal, "Text book of Engineering Mathematics", Third 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", 7th Edition, Pearson Education, (2007).
3. Jain R.K and Iyengar S.R.K," Advanced Engineering Mathematics", 3rd Edition, Narosa Publishing House Pvt. Ltd., (2007).

UNIT-I: ACOUSTICS & ULTRASONICS

Classifications of sound – Characteristics of musical sound – Intensity – Loudness – Weber Fechner law – Decibel – reverberation – reverberation time, derivation of Sabine's formula for reverberation – (Jager's Method) - absorption coefficient and its determination – factors affecting acoustics of building (optimum reverberation time, loudness, focusing, echo, echelon, effect, resonance, and noise) and their remedies – Ultrasonic production –Magnetostriction and piezoelectric methods – Properties – applications of ultrasonic with particular reference to detection of flaws in metal (Non – Destructive testing NDT) – SONAR.

UNIT II LASER & ITS APPLICATIONS

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

UNIT III CRYSTAL PHYSICS

Lattice –Unit cell –Bravais lattice –Lattice Planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – atomic radius – Coordination number –Packing factor for SC, FCC and HCP structure –Polymorphism and allotropy – Crystal defects – point, line and surface defects.

UNIT IV PROPERTIES OF MATTER

Elasticity – types of moduli of elasticity – stress strain diagram –Young's modulus of elasticity – rigidity modulus – bulk modulus – Factors affecting elasticity – twisting couple on a wire – Torsional pendulum – determination of rigidity modulus of a wire – depression of a cantilever – Young's modulus by cantilever – uniform and non uniform bending – viscosity – Coefficient of viscosity – Determination of viscosity - Poiseuille's Method –Ostwalds viscometer – comparison of viscosities.

UNIT V OPTICS & FIBER OPTICS

Air Wedge theory and experiment – testing of flat surfaces –anti reflection coating – Michelson interferometer – types of fringes, determination of wave length of monochromatic source and thickness of a thin transparent sheet – Double refraction – Photoelasticity – Photoelastic effect – Photoelastic analysis –Photoelastic material – Block diagram of a photoelastic bench. Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle – Types – Types of optical fibres (material, refraction index, mode)- Double crucible technique of fibre drawing – Fibre drawing – Fibre optical communication system (Block diagram)

TEXT BOOK:

1. S.Stella Mary , m. Parasuraman and a. Mohammed Hidayathullah , 'Engineering Physics I R.K. Publishers, Coimbatore (2012)

REFERENCES:

1. R.K. Gaur and S.C.Gupta, "Engineering Physics" Dhanpat Rai Publications , New Delhi(2003)
2. M.N. Avadhanulu and PG Kshirsagar, 'A Text book of Engineering Physics' S.Chand and company, Ltd. New Delhi, 2005.
3. Serway and Jewett, 'Physics for Scientists and Engineering with Modern Physics', 6th Edition, Thomson Brooks/Cole, Indian reprint (2007).
4. Rajendran, Vand Marikani A, 'Engineering Physics' Tata McGraw Hill Publications Ltd,III edition New Delhi,(2004).
5. Palaniswamy, P.K. 'Engineering Physics' Scitech publications,Chennai,(2007)
6. Jayakumar.s 'Engineering Physics' , R.K.publishers, Coimbatore. (2007)
7. Jayakumar. S 'Engineering Physics', Pearson Education,New Delhi, (2007).
8. Dr. P. Santhana Raghavan, Dr.P. Ramasamy, Crystal Growth- Process and Methods –KRU Publications-Kumbakonam.

AIM

To impart a sound knowledge on principles of Chemistry involving industrial application oriented topics required for all engineering branches.

OBJECTIVES

- The student should be conversant with the principles, treatment of water for potable and industrial purposes
- Principles of polymer chemistry and its application in industries
- Industrial application of surface chemistry
- Conventional and Non-conventional energy sources and Principle and working of energy storage devices
- Chemistry of engineering materials and their industrial applications.

UNIT I WATER TECHNOLOGY

Characteristics –alkalinity-types of alkalinity and determination - Water - Hardness and problems - Estimation of Hardness by EDTA method - Problems in EDTA Titrations - Domestic water treatment-Disinfection methods (boiling, bleaching powder, chlorination UV treatment, ozonisation) Boiler feed water- Requirements -Disadvantages of using hard water in boilers-Scale and sludge formation, Carry over trouble, Caustic embrittlement and Boiler corrosion –Internal conditioning- colloidal,carbonate,phosphate and calgon conditioning methods. External conditioning -Zeolite Process and Demineralization process- Desalination - Reverse osmosis and Electro dialysis

UNIT II POLYMERS AND COMPOSITES

Polymers - Definition –Nomenclature -Functionality- Polymerization –Types -addition condensation, copolymerization and co-ordination polymerization –Mechanism of free radical and Co-ordination polymerization -Plastics-Classification -Preparation ,properties and uses of PVC, Teflon – Polycarbonates, Polyurethanes,Nylon 6,6, PET- Rubber-Vulcanisation of rubber ,synthetic rubber,Butyl rubber ,SBR.

Composites- Definition – Types of Composites - Polymer matrix composites –Metal matrix composites – Ceramic matrix composites ,properties and their application

UNIT III SURFACE CHEMISTRY

Adsorption – Terminology –Types- physical adsorption and chemical adsorption -Differences - Adsorption of gases on solids -Adsorption isotherms -Freundlich adsorption isotherm -Langmuir adsorption isotherm – Limitation. Adsorption of solutes from solutions - Ion exchange adsorption- Pollution abatement -Chromatography
Catalysis –Types-- Role of adsorbent in catalysis.

UNIT IV NON –CONVENTIONAL ENERGY SOURCES AND ENERGY STORAGE DEVICES

Nuclear energy – Difference between chemical and nuclear reactions -fusion and fission reactions – Binding energy – Mass defect-problems- Nuclear reactor- components -Light water nuclear power plant -Breeder reactor –Atom bomb.

Solar energy conversion-Solar cells, wind energy --Fuel cells– Hydrogen-oxygen fuel cell – Batteries – Dry cell- alkaline battery -Lead - acid battery –Nickel –Cadmium battery - Lithium battery- Lithium – Sulphur battery.

UNIT V ENGINEERING MATERIALS

Refractories –classification –acidic, basic and neutral refractories-properties of refractories – refractoriness- refractoriness under load –dimensional stability-porosity-thermal spalling-chemical inertness-Manufacture of alumina, magnesite and zirconia bricks - Abrasives- natural and synthetic abrasives- Quartz, corundum, emery, garnet, diamond, silicon carbide ,alundum and boron carbide- Lubricants- Mechanism of lubrication – Classification - Solid lubricants-graphite and molybdenum disulphide.- Semi -Solid lubricants – Grease- Liquid lubricants -Synthetic lubricants - Blended oils - Properties- Viscosity ,Viscosity index, Flash and fire points, Cloud and pour points,Oiliness. and their significance –Adhesives -Classification and applications

Nano chemistry- Introduction –Properties –Carbon nanotubes –Classification – Synthesis – Applications

TEXT BOOKS

1. P.C.Jain and Monica Jain , 'Engineering Chemistry', Dhanpat Rai Pub Co Ltd New Delhi (2002)
2. S.S.Dara , ' A Text Book of Engineering Chemistry', S.Chand & Co Ltd New Delhi (2006)
3. Dr.Sayeeda Sultana " Engineering chemistry " Vol-I Professional and Technical Publishers, Coimbatore (2011)

REFERENCE BOOKS

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

AIM

To develop graphic skills in students.

OBJECTIVES

To develop in students graphic skill for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.

Concepts and conventions (Not for Examination)

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HAND SKETCHING**Curves used in engineering practices:**

Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

Free hand sketching:

Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT III PROJECTION OF SOLIDS

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

UNIT IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES

Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – Obtaining true shape of section.

Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones.

Perspective projection of prisms, pyramids and cylinders by visual ray method.

TEXT BOOKS:

1. N.D. Bhatt, "Engineering Drawing" Charotar Publishing House, 46th Edition, (2003).

REFERENCES:

1. K. V. Natrajan, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai (2006).
2. M.S. Kumar, "Engineering Graphics", D.D. Publications, (2007).
3. K. Venugopal & V. Prabhu Raja, "Engineering Graphics", New Age International (P) Limited (2008).
4. M.B. Shah and B.C. Rana, "Engineering Drawing", Pearson Education (2005).
5. K. R. Gopalakrishnana, "Engineering Drawing" (Vol.I&II), Subhas Publications (1998).
6. Dhananjay A.Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGraw Hill Publishing Company Limited (2008).
7. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, (2008).

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. Whenever the total number of candidates in a college exceeds 150, the University Examination in that college will be conducted in two sessions (FN and AN on the same day) for 50 percent of student (approx) at a time.

AIM :

To provide an awareness to Computing and Programming

OBJECTIVES :

- To enable the student to learn the major components of a computer system
- To know the correct and efficient ways of solving problems
- To learn to use office automation tools
- To learn to program in C

UNIT I INTRODUCTION TO COMPUTERS

Introduction – Characteristics of Computers – Evolution of Computers - Computer Generations – Classification of Computers – Basic Computer organization – Number Systems

UNIT II COMPUTER SOFTWARE

Computer Software –Types of Software – Software Development Steps – Internet Evolution - Basic Internet Terminology – Getting connected to Internet Applications.

UNIT III PROBLEM SOLVING AND OFFICE APPLICATION SOFTWARE

Planning the Computer Program – Purpose – Algorithm – Flow Charts – Pseudocode -Application Software Packages- Introduction to Office Packages (not detailed commands for examination).

UNIT IV INTRODUCTION TO C

Overview of C – Constants, Variables and Data Types – Operators and Expressions – Managing Input and Output operators – Decision Making - Branching and Looping.

UNIT V FUNCTIONS AND POINTERS

Handling of Character Strings – User-defined Functions – Definitions – Declarations - Call by reference – Call by value – Structures and Unions – Pointers – Arrays – The Preprocessor – Developing a C Program : Some Guidelines

TEXT BOOKS:

1. Ashok.N.Kamthane, " Computer Programming", Pearson Education (India) (2008).
2. Behrouz A.Forouzan and Richard.F.Gilberg, "A Structured Programming Approach Using C", II Edition, Brooks-Cole Thomson Learning Publications, (2007).

REFERENCES:

1. Pradip Dey, Manas Ghoush, "Programming in C", Oxford University Press. (2007).
2. Byron Gottfried, "Programming with C", 2nd Edition, (Indian Adapted Edition), TMH publications, (2006).
3. Stephen G.Kochan, "Programming in C", Third Edition, Pearson Education India, (2005).
4. Brian W.Kernighan and Dennis M.Ritchie, "The C Programming Language", Pearson Education Inc., (2005).
5. E.Balagurusamy, "Computing fundamentals and C Programming", Tata McGraw-Hill Publishing Company Limited, (2008).
6. S.Thamarai Selvi and R.Murugan, "C for All", Anuradha Publishers, (2008).

LIST OF EXERCISES

a) Word Processing

1. Document creation, Text manipulation with Scientific notations.
2. Table creation, Table formatting and Conversion.
3. Mail merge and Letter preparation.
4. Drawing - flow Chart

b) Spread Sheet

5. Chart - Line, XY, Bar and Pie.
6. Formula - formula editor.
7. Spread sheet - inclusion of object, Picture and graphics, protecting the document and sheet.
8. Sorting and Import / Export features.

Simple C Programming

9. Data types, Expression Evaluation, Condition Statements.
10. Arrays
11. Structures and Unions
12. Functions

* For programming exercises Flow chart and pseudocode are essential

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS

Hardware

- LAN System with 33 nodes (OR) Standalone PCs – 33 Nos.
- Printers – 3 Nos.

Software

- OS – Windows / UNIX Clone
- Application Package – Office suite
- Compiler – C

OBJECTIVES

To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)

I CIVIL ENGINEERING PRACTICE

Buildings:

- (a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:

- (a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
- (b) Study of pipe connections requirements for pumps and turbines.
- (c) Preparation of plumbing line sketches for water supply and sewage works.
- (d) Hands-on-exercise:
 - Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
- (e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

- (a) Study of the joints in roofs, doors, windows and furniture.
- (b) Hands-on-exercise:
 - Wood work, joints by sawing, planing and cutting.

II MECHANICAL ENGINEERING PRACTICE

Welding:

- (a) Preparation of arc welding of butt joints, lap joints and tee joints.
- (b) Gas welding practice

Basic Machining:

- (a) Simple Turning and Taper turning
- (b) Drilling Practice

Sheet Metal Work:

- (a) Forming & Bending:
- (b) Model making – Trays, funnels, etc.
- (c) Different type of joints.

Machine assembly practice:

- (a) Study of centrifugal pump
- (b) Study of air conditioner

Demonstration on:

- (a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
- (b) Foundry operations like mould preparation for gear and step cone pulley.
- (c) Fitting – Exercises – Preparation of square fitting and vee – fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of an electrical equipment.

IV ELECTRONICS ENGINEERING PRACTICE

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, EOR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

REFERENCES:

1. K.Jeyachandran, S.Natarajan & S, Balasubramanian, "A Primer on Engineering Practices Laboratory", Anuradha Publications, (2007).
2. T.Jeyapoovan, M.Saravanapandian & S.Pranitha, "Engineering Practices Lab Manual", Vikas Publishing House Pvt.Ltd, (2006)
3. H.S. Bawa, "Workshop Practice", Tata McGraw – Hill Publishing Company Limited, (2007).
4. A. Rajendra Prasad & P.M.M.S. Sarma, "Workshop Practice", Sree Sai Publication, (2002).
5. P.Kannaiah & K.L.Narayana, "Manual on Workshop Practice", Scitech Publications, (1999).

SEMESTER EXAMINATION PATTERN

The Laboratory examination is to be conducted for Group A & Group B, allotting 90 minutes for each group, with a break of 15 minutes. Both the examinations are to be taken together in sequence, either in the FN session or in the AN session. The maximum marks for Group A and Group B lab examinations will be 50 each, totaling 100 for the Lab course. The candidates shall answer either I or II under Group A and either III or IV under Group B, based on lots.

Engineering Practices Laboratory

List of equipment and components (For a Batch of 30 Students)

CIVIL

- | | |
|---|----------|
| 1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings. | 15 Sets. |
| 2. Carpentry vice (fitted to work bench) | 15 Nos. |
| 3. Standard woodworking tools | 15 Sets. |
| 4. Models of industrial trusses, door joints, furniture joints | 5 each |
| 5. Power Tools: | |
| (a) Rotary Hammer | 2 Nos |
| (b) Demolition Hammer | 2 Nos |
| (c) Circular Saw | 2 Nos |
| (d) Planer | 2 Nos |
| (e) Hand Drilling Machine | 2 Nos |
| (f) Jigsaw | 2 Nos |

MECHANICAL

- | | |
|---|-----------|
| 1. Arc welding transformer with cables and holders | 5 Nos. |
| 2. Welding booth with exhaust facility | 5 Nos. |
| 3. Welding accessories like welding shield, chipping hammer, wire brush, etc. | 5 Sets. |
| 4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit. | 2 Nos. |
| 5. Centre lathe | 2 Nos. |
| 6. Hearth furnace, anvil and smithy tools | 2 Sets. |
| 7. Moulding table, foundry tools | 2 Sets. |
| 8. Power Tool: Angle Grinder | 2 Nos |
| 9. Study-purpose items: centrifugal pump, air-conditioner | One each. |

ELECTRICAL

- | | |
|---|---------|
| 1. Assorted electrical components for house wiring | 15 Sets |
| 2. Electrical measuring instruments | 10 Sets |
| 3. Study purpose items: Iron box, fan and regulator, emergency lamp | 1 each |
| 4. Megger (250V/500V) | 1 No. |
| 5. Power Tools: (a) Range Finder | 2 Nos |
| (b) Digital Live-wire detector | 2 Nos |

ELECTRONICS

- | | |
|---|---------|
| 1. Soldering guns | 10 Nos. |
| 2. Assorted electronic components for making circuits | 50 Nos. |
| 3. Small PCBs | 10 Nos. |
| 4. Multimeters | 10 Nos. |
| 5. Study purpose items: Telephone, FM radio, low-voltage power supply | |

**112PCP03 - PHYSICS & CHEMISTRY LABORATORY – I
COMMON TO ALL BRANCHES**

PHYSICS LABORATORY (Any Ten Experiments)

1. Determination of Young's modulus of the material – non uniform bending.
2. Determination of Young's modulus of the material – uniform bending .
3. Determination of viscosity of liquid – Poiseuille's method.
4. Torsional pendulum – Determination of rigidity modulus.
5. Determination of the thermal conductivity of a bad conductor – Lee's Disc method.
6. Determination of the thickness of a thin wire – Air Wedge method.
7. (a) Particle size determination using Diode Laser.
(b) Determination of Laser Parameters – Wave length, and angle of divergence.
(c) Determination of acceptance angle in an optical fiber.
8. Spectrometer dispersive power of a prism.
9. Determination of Wave length of mercury spectrum –Spectrometer grating.
10. Determination of Band Gap of a Semiconductor diode.
11. Determination of velocity of sound and compressibility of liquid- Ultrasonic interferometer.
12. Determination of Hysteresis loss in a ferromagnetic material

- **A minimum of FIVE experiments shall be offered in Each Semester.**
- **Laboratory classes on alternate weeks for physics and chemistry.**
- **The lab examinations will be held only in the second Semester.**

CHEMISTRY LABORATORY – I

LIST OF EXPERIMENTS

1. Estimation of hardness of Water by EDTA method
2. Estimation of Copper in brass by EDTA method
3. Determination of DO in water (Winkler's method)
4. Estimation of Chloride in Water sample (Argentometric)
5. Estimation of alkalinity of Water sample
6. Determination of molecular weight and degree of polymerization of a polymer by viscometry.
7. Determination of cloud and pour point of a Lubricating oil
 - Any five experiments

212EHT01 - TECHNICAL ENGLISH II

AIM:

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

OBJECTIVES:

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

UNIT I

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 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

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

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:

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

UNIT IV

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

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.

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.

212MAT02 - MATHEMATICS – II

UNIT I ORDINARY DIFFERENTIAL EQUATIONS

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

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 parallelepipeds.

UNIT III ANALYTIC FUNCTIONS

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

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

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.

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).

212PHT03 – ENGINEERING PHYSICS II

UNIT I: CONDUCTING MATERIALS

Conductors – classical free electron theory of metals-Electrical and thermal conductivity –Derivation – Wiedemann – Franz law – Lorentz number – Draw backs of Classical free electron theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi function – Density of energy states – Carrier concentration in metals.

UNIT II: SEMICONDUCTING MATERIALS

INTRINSIC SEMICONDUCTOR: Intrinsic semiconductor – Density of electrons in conduction band – Density of holes in valence band – Intrinsic carrier concentration – derivation – Fermi level – Variation – of Fermi with temperature – electrical conductivity – mobility – band gap determination.

EXTRINSIC SEMICONDUCTOR: Extrinsic semiconductors – carrier concentration derivation in n- type and p- type semiconductor variation of Fermi level with temperature and impurity concentration – compound semiconductors.

UNIT III: DIELECTRIC MATERIALS

Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarization- internal field – Claussius – Mosotti relation (derivation) – dielectric loss - dielectric breakdown – uses of dielectric materials (capacitor and transformer) Ferro electricity and applications.

UNIT IV: QUANTUM AND SUPER CONDUCTING MATERIALS

Black body radiation – Planck's theory (derivation) – Deduction of Wien' displacement law and Rayleigh – jeans' Law from Planck's theory - Compton Effect – Theory and experimental verification – Matter waves – Schrodinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box – Superconductivity: Properties – Types of super conductors – BCS theory of superconductivity(Qualitative) – High T_c superconductors – Applications of super conductors - SQUID, cryotron, magnetic levitation.

UNIT V: NEW ENGINEERING & NANO MATERIALS

Metallic glasses: Preparation, properties and applications – Shape memory alloys (SMA): Characteristic, Properties of NiTi alloy, application, advantages and disadvantages of SMA-synthesis –Plasma arcing – Chemical vapour deposition – sol-gels – eletrodeposition – ball milling – properties of nanoparticles and applications Carbon nanotubes: fabrication – arc method –pulsed laser deposition – chemical vapour deposition –Structure – properties and applications.

Text Books:

1. S. Stella Mary, M. Parasuraman and A. Mohammed Hidayathullah, 'Engineering Physics II' R.K Publishers, Coimbatore(2012).

REFERENCES:

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)
3. Rajendran. v and Marikani.A. 'Materials Science' Tata McGraw hill publications, (2004) New Delhi.
4. Jayakumar. S, 'Materials Science' R.K. Publishers, Coimbatore, (2008).
5. Palanisamy P.K, 'Materials Science' , Scitech publications (India) Pvt. Ltd., Chennai, Second Edition(2007).
6. M. Arumugam, 'Materials Science' Anuradha Publications, Kumbakonam, (2006).

212CYT04 ENGINEERING CHEMISTRY –II

To impart a sound knowledge on principles of Chemistry involving industrial application oriented topics required for all engineering branches.

Objectives

- The student should be conversant with the principles of Electrochemistry Electrochemical cells and their applications.
- Principles of corrosion and its inhibition.
- Chemistry of fuels and combustion.
- Importance of phase rule, alloys and their industrial application.
- Analytical techniques and their instrumentation.

UNIT I ELECTROCHEMISTRY

Electrochemical cells-Reversible and irreversible cells-Concentration cells -EMF Measurement of emf-Single electrode potential -Nernst equation(problem)-Reference electrodes-Standard hydrogen electrode-Calomel electrode-Ion selective electrode-Glass electrode-Measurement of pH-Electrochemical series-significance- Potentiometric titration (redox Fe^{2+} Vs Dichromate,) - Conductometric titrations (acid-base and precipitation titrations)

UNIT II CORROSION AND CORROSION CONTROL

Chemical corrosion -Pilling- Bedworth rule-electrochemical corrosion -mechanism Different types of corrosion-Galvanic corrosion-Differential aeration corrosion -pitting corrosion-waterline corrosion - stress corrosion -crevice corrosion-Factors influencing corrosion -corrosion control-sacrificial anode and impressed cathodic current methods-corrosion inhibitors -protective coatings-paints-constituents-functions- metallic coatings- anodic coating -cathodic coating- metal cladding -diffusion coating - electroplating of gold and electroless plating of nickel.

UNIT III FUELS AND COMBUSTION

Calorific value -Classification-coal -Proximate analysis and Ultimate analysis-Metallurgical Coke-Manufacture by Bee-hive oven and Otto-Hoffmann method-Petroleum processing and fractions-Cracking -Catalytic cracking and methods-Knocking -octane number -cetane number-Synthetic petrol-Fischer -Tropsch and Bergius process-Gaseous fuels-,Water gas-Producer gas., CNG and LPG-Flue gas analysis-Orsat apparatus-Theoretical air for combustion-Problems

UNIT IV PHASE RULE AND ALLOYS

Statement and Explanation of terms involved with examples- Phase diagram-One Component system-Water system- Condensed phase rule-Construction of phase diagram by Thermal analysis-Simple eutectic system(Lead-silver system only)- Limitations of phase rule-Alloys-importance of Ferrous alloys-Nichrome-Alnico -Stainless steel-Heat treatment of steel -Non-Ferrous alloys -Brass and Bronze

UNIT V ANALYTICAL TECHNIQUES

Spectroscopy -Atomic and molecular spectroscopy-Absorption spectrum -Emission spectrum - Absorbance-Beer-Lamberts law-Problems-UV Visible spectroscopy -IR spectroscopy-(principle, instrumentation (block diagram only)and applicationscolorimetry(principle ,instrumentation and applications)-Estimation of iron by colorimetry.Flame photometry-(principle, instrumentation and applications)-Estimation of Sodium by Flame photometry-Atomic absorption spectroscopy(principle, instrumentation and applications)-Estimation of Nickel by Atomic absorption spectroscopy.

TEXT BOOKS

1. P.C.Jain and Monica Jain , 'Engineering Chemistry', Dhanpat Rai Pub Co Ltd ,New Delhi (2002)
2. S.S.Dara , ' A Text Book of Engineering Chemistry', S.Chand & Co Ltd New Delhi (2006)
3. Dr.Sayeeda Sultana " Engineering chemistry " Vol -II, Professional and Technical publishers ,Coimbatore (2011)

REFERENCE BOOKS

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

212EMT05 - ENGINEERING MECHANICS

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**

Introduction – Units and Dimensions – Laws of Mechanics – Lamé'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**

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**

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**

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**

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.

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. Hibbeler, 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).

212CCT05 - CIRCUIT THEORY
(Common to EEE, EIE and ICE Branches)

UNIT I BASIC CIRCUITS ANALYSIS

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:

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Norton & Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem.

UNIT III RESONANCE AND COUPLED CIRCUITS

Series and parallel 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

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

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

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)

212EDT05 - ELECTRIC CIRCUITS AND ELECTRON DEVICES
(For ECE, CSE, IT and Biomedical Engg. Branches)

UNIT I CIRCUIT ANALYSIS TECHNIQUES

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

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

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

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)

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.

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 Edition, (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, Satyabranta Jit, "Electronic Devices & Circuits", Tata McGraw Hill, 2nd Edition, 2008.

**212EET06 - BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(Common to branches under Civil, Mechanical and Technology faculty)**

UNIT I ELECTRICAL CIRCUITS & MEASUREMENTS

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

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

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

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

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).

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)

**212CMT06 - BASIC CIVIL & MECHANICAL ENGINEERING
(Common to branches under Electrical and I & C Faculty)**

A – CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS

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

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.

B – MECHANICAL ENGINEERING

UNIT III POWER PLANT ENGINEERING

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

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

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.

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).

212CLP01 - COMPUTER PRACTICE LABORATORY – II

LIST OF EXPERIMENTS

1. UNIX COMMANDS

Study of Unix OS - Basic Shell Commands - Unix Editor

2. SHELL PROGRAMMING

Simple Shell program - Conditional Statements - Testing and Loops

3. C PROGRAMMING ON UNIX

Dynamic Storage Allocation-Pointers-Functions-File Handling

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

**212PCP02 - PHYSICS & CHEMISTRY LABORATORY – II
COMMON TO ALL BRANCHES**

PHYSICS LABORATORY (Any Ten Experiments)

2. Determination of Young's modulus of the material – non uniform bending.
3. Determination of Young's modulus of the material – uniform bending .
4. Determination of viscosity of liquid – Poiseuille's method.
5. Torsional pendulum – Determination of rigidity modulus.
6. Determination of the thermal conductivity of a bad conductor – Lee's Disc method.
7. Determination of the thickness of a thin wire – Air Wedge method.
8. (a) Particle size determination using Diode Laser.
(b) Determination of Laser Parameters – Wave length, and angle of divergence.
(c) Determination of acceptance angle in an optical fiber.
9. Spectrometer dispersive power of a prism.
10. Determination of Wave length of mercury spectrum –Spectrometer grating.
11. Determination of Band Gap of a Semiconductor diode.
12. Determination of velocity of sound and compressibility of liquid- Ultrasonic Interferometer.
13. Determination of Hysteresis loss in a ferromagnetic material

- **A minimum of FIVE experiments shall be offered in Each Semester.**
- **Laboratory classes on alternate weeks for physics and chemistry.**
- **The lab examinations will be held only in the second Semester.**

CHEMISTRY LABORATORY – II

LIST OF EXPERIMENTS

1. Conductometric titration (Simple acid base)
2. Conductometric titration (Mixture of weak and strong acids Vs base)
3. Conductometric titration using BaCl_2 Vs Na_2SO_4
4. Potentiometric Titration ($\text{Fe}^{2+}/\text{KMnO}_4$ or $\text{K}_2\text{Cr}_2\text{O}_7$)
5. PH titration (acid & base)
6. Determination of water of crystallization of a crystalline salt (Copper sulphate)
7. Estimation of Ferric iron by spectrophotometry.
8. Estimation of sodium and potassium by flame photometry.
 - Any five experiments.

212DMP03 COMPUTER AIDED DRAFTING AND MODELING LABORATORY

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.

212ELP03 - ELECTRICAL CIRCUIT LABORATORY
(Common to EEE, EIE and ICE)

LIST OF EXPERIMENTS

1. Verification of ohm's laws and kirchoff's laws.
2. Verification of Thevenin'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.

212CDP03 CIRCUITS AND DEVICES LABORATORY

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.

312CET01 - TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS
(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 Differential 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.

1. FOURIER SERIES

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 identity – Harmonic Analysis.

2. FOURIER TRANSFORMS

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

3. PARTIAL DIFFERENTIAL EQUATIONS

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.

4. APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

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.

5. Z -TRANSFORMS AND DIFFERENCE EQUATIONS

Z-transforms - Elementary properties – Inverse Z-transform – Convolution theorem -Formation of difference equations – Solution of difference equations using Z-transform.

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).

312CET02 - ENVIRONMENTAL SCIENCE AND ENGINEERING (Credit = 2)
(Common to Civil, CSE & IT)

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

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

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

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

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

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.

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)

312CET03 - APPLIED GEOLOGY

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

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

Elementary knowledge on symmetry elements of important crystallographic systems – physical properties of minerals – study of the following rock forming minerals – Quartz family. Feldspar 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

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 conglom, Conglomerate and breccia. Metamorphic rocks. Quartzite, Marble, Slate, Phyllite, Gneiss and Schist.

UNIT IV STRUCTURAL GEOLOGY AND GEOPHYSICAL METHOD

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

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.

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

312CET04 - MECHANICS OF SOLIDS

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

Rigid bodies and deformable solids – stability, strength, stiffness – tension, compression and shear stresses – strain, elasticity, Hooke's law, limit of proportionately, modulus 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

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

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

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

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.

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.

312CET05 - MECHANICS OF FLUIDS

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

Definitions – Fluid and fluid mechanics – Dimensions and units – Fluid properties – Continuum Concept of system and control volume

UNIT II FLUID STATICS & KINEMATICS

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

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

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

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

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. Parnard Messay, "Mechanics of Fluids" 7th Edition, Nelson Thornes Ltd. U. K. 1998.

312CET06 - CONSTRUCTION TECHNIQUES, EQUIPMENT AND PRACTICES

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

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

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

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

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

Selection of equipment for earth work - earth moving operations - types of earthwork equipment - tractors, motor graders, scrapers, front end loaders, 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,

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

312CET07 - SURVEYING I

OBJECTIVE

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

1. INTRODUCTION AND CHAIN SURVEYING

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.

2. COMPASS SURVEYING AND PLANE TABLE SURVEYING

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.

3. LEVELLING AND APPLICATIONS

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.

4. THEODOLITE SURVEYING

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.

5. ENGINEERING SURVEYS

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.

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.

312CEP01 - SURVEY PRACTICAL I

OBJECTIVE

1. At the end of the course the student will possess knowledge about Survey field techniques
2. Study of chains and its accessories
3. Aligning, Ranging and Chaining
4. Chain Traversing
5. Compass Traversing
6. Plane table surveying: Radiation
7. Plane table surveying: Intersection
8. Plane table surveying: Traversing
9. Plane table surveying: Resection – Three point problem
10. Plane table surveying: Resection – Two point problem
11. Study of levels and levelling staff
12. Fly levelling using Dumpy level
13. Fly levelling using tilting level
14. Check levelling
15. LS and CS
16. Contouring
17. Study of Theodolite

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	

312CEP02 - COMPUTER AIDED BUILDING DRAWING

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

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

14. Building drawing – Shah.M.G., Tata McGraw-Hill, 1992
15. Building planning & Drawing – Kumaraswamy N., Kameswara Rao A., Charotar Publishing
16. 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

412CET01 - NUMERICAL METHODS (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:

- a. 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.
- b. 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.
- c. 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.
- d. 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.

1. SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS

Solution of equation –Fixed point iteration: $x=g(x)$ method - Newton's method – Solution of linear system by Gaussian elimination and Gauss-Jordan method– Iterative method - Gauss-Seidel method - Inverse of a matrix by Gauss Jordan method – Eigen value of a matrix by power method and by Jacobi method for symmetric matrix.

2. INTERPOLATION AND APPROXIMATION

Lagrangian Polynomials – Divided differences – Interpolating with a cubic spline – Newton's forward and backward difference formulas.

3. NUMERICAL DIFFERENTIATION AND INTEGRATION

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.

4. INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS

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.

6. BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS

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.

TEXT BOOKS

1. Veerarjan, T and Ramachandran, T., "Numerical methods with programming in C", Second Edition, Tata McGraw-Hill Publishing.Co.Ltd, 2007.
2. Sankara Rao K, "Numerical Methods for Scientists 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.

412CET02 - SOIL MECHANICS

OBJECTIVE

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

1. INTRODUCTION

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.

2. SOIL WATER AND WATER FLOW

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.

3. STRESS DISTRIBUTION, COMPRESSIBILITY AND SETTLEMENT

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

4. SHEAR STRENGTH

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.

5. SLOPE STABILITY

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

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.

412CET03 - STRENGTH OF MATERIALS

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.

1. ENERGY PRINCIPLES

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

2. INDETERMINATE BEAMS

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)

3. COLUMNS

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.

4. STATE OF STRESS IN THREE DIMENSIONS

Spherical and deviatoric 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

5. ADVANCED TOPICS IN BENDING OF BEAMS

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

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.

412CET04 - APPLIED HYDRAULIC ENGINEERING

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.

1. OPEN CHANNEL FLOW

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.

2. UNIFORM FLOW

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

3. VARIED FLOW

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.

4. PUMPS

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.

5. TURBINES

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

TEXT BOOKS

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

REFERENCES

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

412CET05 - SURVEYING II

OBJECTIVE

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

1. TACHEOMETRIC SURVEYING

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.

2. CONTROL SURVEYING

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

3. SURVEY ADJUSTMENTS

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.

4. ASTRONOMICAL SURVEYING

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.

5. HYDROGRAPHIC AND ADVANCE SURVEYING

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

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.

412CET06 - HIGHWAY ENGINEERING

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.

1. HIGHWAY PLANNING AND ALIGNMENT

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

2. GEOMETRIC DESIGN OF HIGHWAYS

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]

3. FLEXIBLE AND RIGID PAVEMENTS

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.

4. HIGHWAY MATERIALS AND CONSTRUCTION PRACTICE

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]

5. HIGHWAY MAINTENANCE

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],

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)

412CEP01 - STRENGTH OF MATERIALS LABORATORY

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 EXPERIMENT

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)

Sl. 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) Brinell }	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

412CEP02 - HYDRAULIC ENGINEERING LAB

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.

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

412CEP03 - SURVEY PRACTICAL II

OBJECTIVE

At the end of the course the student will possess 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) -
7. Transition curve.
8. Field observation for and Calculation of azimuth
9. Field work using Total Station.

FIFTH SEMESTER

512CET01 - IRRIGATION ENGINEERING

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

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

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

UNIT III DIVERSION AND IMPOUNDING STRUCTURES

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

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

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.

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 Prahesan, 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.

512CET02 - STRUCTURAL ANALYSIS I

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

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 (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

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

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

UNIT V MOMENT DISTRIBUTION METHOD

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.

TEXT BOOKS

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

512CET03 - RAILWAYS, AIRPORTS AND HARBOUR ENGINEERING

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

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

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, Attractive Power, Track Resistance, Level Crossings.

UNIT III AIRPORT PLANNING AND DESIGN

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

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

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 - Mooring Accessories, Navigational Aids – Coastal Structures- Breakwaters, Wharves.

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. Mundry, "A course in Railway Track Engineering". Tata McGraw Hill, 2000.

512CET04 - ENVIRONMENTAL ENGINEERING – I

OBJECTIVE

- To make the students conversant with principles of water supply, treatment and distribution

UNIT I PLANNING FOR WATERSUPPLY SYSTEM

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

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

Objectives -Unit operations and processes -Principles, functions design and drawing of Flash mixers, flocculators, sedimentation tanks and sand filters -Disinfection- Residue Management.

UNIT IV ADVANCED WATER TREATMENT

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

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.

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.

512CET05 - FOUNDATION ENGINEERING

OBJECTIVE

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

UNIT I SITE INVESTIGATION AND SELECTION OF FOUNDATION

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

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

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

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

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.

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.

512CET06 - DESIGN OF RC ELEMENTS

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

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 – cracked and uncracked sections.

UNIT II LIMIT STATE DESIGN FOR FLEXURE

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

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

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

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.

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.

512CEP01 - CONCRETE AND HIGHWAY ENGINEERING

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 Elasticity

III. TESTS ON BITUMEN

1. Penetration
2. Softening Point
3. Ductility
4. Viscosity
5. Elastic Recovery

IV. TESTS ON AGGREGATES

1. Stripping
2. Proportioning of Aggregates
3. Water Absorption
4. Aggregate impart test

V. TESTS ON BITUMINOUS MIXES

1. Determination of Binder Content
2. Marshall Stability and Flow values
3. Specific Gravity
4. Density.

LIST OF EQUIPMENTS
(FOR A BATCH OF 30 STUDENTS)

S.No.	Description of Equipment	Quantity
1.	Concrete cube moulds	6
2.	Concrete cylinder moulds	3
3.	Concrete Prism moulds	3
4.	Sieves	1 Set
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.	Blains Apparatus	1
14.	Penetration test apparatus for test on Bitumen	1
15.	Ring and ball apparatus	1
16.	Ductility testing machine	1
17.	Bitumen viscometer (in poises)	1
18.	Hot Air oven (amtinent to 250 c	1
19.	Centrifuge Bistumen extractor	1
20.	Marshall specimen compactor	1
21.	Marshall testing machine	1
22.	Specific gravity bottles (conical 50ml capacity)	1
23.	Weighing balance (0.18 accurancy)	1

512CEP02 - SOIL MECHANICS LABORATORY

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.
 1. Direct shear test on cohesionless soil
 2. Unconfined compression test on cohesive soil
 3. Triaxial compression test (demonstration only)
 9. One dimensional consolidation test (Demonstration only)
 10. Field density test (Core cutter and sand replacement methods)

LIST OF EQUIPMENT (For a batch of 30 students)

S.No.	Description of Equipment	Quantity
1.	Sieves	2 sets
2.	Hydrometer	2 sets
3.	Liquid and plastic limit apparatus	2 sets
4.	Shrinkage 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

**SIXTH SEMESTER
612CET01 - PRINCIPLES OF MANAGEMENT**

UNIT I OVERVIEW OF MANAGEMENT

Definition - Management - Role of managers - Evolution of Management thought – Organization and the environmental factors – Trends and Challenges of Management in Global Scenario.

UNIT II PLANNING

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

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

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

UNIT V CONTROLLING

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

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.

612CET02 - STRUCTURAL ANALYSIS – II

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

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

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

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

UNIT IV PLASTIC ANALYSIS OF STRUCTURES

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

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

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.

612CET03 - DESIGN OF STEEL STRUCTURES

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

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

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

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

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

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

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).

612CET04 - CONSTRUCTION PLANNING & SCHEDULING

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

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

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

UNIT III COST CONTROL MONITORING AND ACCOUNTING

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

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

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.

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 Principles and Applications ", Affiliated East West Press, 2001

REFERENCES

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

612CET05 - ENVIRONMENTAL ENGINEERING II

OBJECTIVE

- To educate the students on the principles and design of Sewage Collection, Conveyance, treatment and disposal.

UNIT I PLANNING FOR SEWERAGE SYSTEMS

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

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

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 Maintenance aspects.

UNIT IV SECONDARY TREATMENT OF SEWAGE

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

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.

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.

ELECTIVE I

612CET06 - HYDROLOGY

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

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

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

UNIT III HYDROGRAPHS

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

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

UNIT V GROUND WATER HYDROLOGY

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

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.

612CET07 - CARTOGRAPHY

OBJECTIVE

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

UNIT I INTRODUCTION

Cartography today - Nature of Cartography - History of Cartography - Graticules - Cartometry.

UNIT II EARTH

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

UNIT III SOURCES OF DATA

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

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

Selection and Generalisation Principles - Symbolisation - Topographic and thematic maps - Map production and Reproduction - Map series.

TEXT BOOKS

1. R.W. ANSON and F.J. ORMELING, Basic Cartography for students and Technicians. Vol. I, II and III, Elsevier Applied Science Publishers 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 1996.

612CET08 - ELECTRONIC SURVEYING

OBJECTIVE

- At the end of the course the student will possess knowledge about Electronic surveying.

UNIT I FUNDAMENTALS

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

UNIT II BASIC ELECTRONICS

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

UNIT III PROPAGATION OF ELECTROMAGNETIC WAVES

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

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

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

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.

612CET09 - REMOTE SENSING TECHNIQUES AND GIS

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

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

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

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

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

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.

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.

612CET10 - ARCHITECTURE

OBJECTIVE

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

UNIT I ARCHITECTURAL DESIGN

Architectural Design – an analysis – integration of function and aesthetics – Introduction to basic elements and principles of design.

UNIT II SITE PLANNING

Surveys – Site analysis – Development Control – Layout regulations- Layout design concepts.

UNIT III BUILDING TYPES

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

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

Planning – Definition, concepts and processes- Urban planning standards and zoning regulations- Urban renewal – Conservation – Principles of Landscape design.

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", HutchinsLondon , 1990.

612CET11 - PROFESSIONAL ETHICS IN ENGINEERING

UNIT I ENGINEERING ETHICS

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

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

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

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

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.

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).

612CET12 - TOTAL QUALITY MANAGEMENT

UNIT I INTRODUCTION

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

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 - PDCA cycle, 5s, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I

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

Quality circles - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Cost of Quality - Performance measures.

UNIT V QUALITY SYSTEMS

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.

TEXT BOOK

1. Dale H. Besterfield, et al., "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.

612CET13 - FUNDAMENTALS OF NANOSCIENCE

UNIT I INTRODUCTION

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

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

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

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

UNIT V CHARACTERISATION TECHNIQUES

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.

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 characterisation 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.

612CET14 - INTELLECTUAL PROPERTY RIGHTS (IPR)

UNIT I

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

UNIT II

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

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

UNIT IV

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

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.

TEXT BOOK

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

REFERENCES

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

www.ipmatters.net/features/000707_gibbs.html.

612CET15 - INDIAN CONSTITUTION AND SOCIETY

UNIT I

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

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.

UNIT III

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.

UNIT IV

Indian Federal System – Center – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries – Assessment of working of the Parliamentary System in India.

UNIT V

Society : Nature, Meaning and definition; Indian Social Structure; Caste, Religion, Language in India; Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.

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.

612CET16 - DISASTER MANAGEMENT

Objective:

To introduce the students to the various types of disasters, principles of disaster management and concepts of disaster preparedness, disaster prevention and mitigation, post disaster recovery and rehabilitation, and the National policy on disaster management.

UNIT – I INTRODUCTION TO DISASTERS

What is disaster – Hazard – Types of hazards - Vulnerability – capacity – risk – major natural hazards – causes and effects – Interaction of multiple hazards – Manmade hazards – Hazard reduction through disaster management – Principles of disaster management – Risk assessment.

UNIT – II DISASTER PREPAREDNESS

Definition – Emergency response – Principles of emergency management – Evacuation plans – Emergency shelters – Medical preparedness aspects –International organisations – National perspective for disaster preparedness – Preparation of disaster management plans – Early warning systems – Earthquake prediction – Hazard mapping.

UNIT – III DISASTER PREVENTION AND MITIGATION

Understanding hazards and their effects - Saving life and reducing economic disruption - Cyclone Shelters - Disaster mitigation – Elements most at risk - Main mitigation strategies for various disasters – community participation – Actions to reduce risk – Passive and active mitigation measures – community based mitigation – Engineering and construction measures – Physical planning measures – Economic measures – Damages to structures and general design guidelines - National initiatives..

UNIT – IV POST DISASTER RECOVERY AND RECONSTRUCTION

Post disaster recovery – Phases and stake holders – Process of Reconstruction and Rehabilitation - Principles and Planning – Implementation - Ensuing Sustainability - Emergency Phase - Community and Government response – Medical efforts - Recovery, Rehabilitation, Transition Shelter, Housing, and Basic Needs – Reconstruction of infrastructure – condition assessment of buildings and structures – Repair and retrofitting of structures – Prefabricated construction.

UNIT – V NATIONAL POLICY ON DISASTER MANAGEMENT

Approaches and objectives – Disaster management continuum – Institutional and Legal Arrangements - Disaster management authorities at national, state, district and local levels - National Institute of Disaster Management - National Disaster Response Force - Institutional arrangements for disaster response – International co-operation – Financial arrangements - Disaster Prevention, Mitigation and Preparedness – Techno Legal Regime - Response and role of various stake holders - Relief and Rehabilitation - Reconstruction and Recovery - Capacity Development – Knowledge management – Research and development.

TEXT BOOKS

1. Disaster Management for Engineers and Management Faculty, Eds. Dr.D.S.Ramachandra Murthy, Dr.T.L.Venkatasubramanian and Dr.P.Partheeban, Charulata Publishers, 2011.

REFERENCES

1. Disaster management in India – a status report, National Disaster Management Division, Ministry of Home Affairs, Govt. of India, August 2004, 86 pages.
2. Confronting natural hazards, An international decade for natural hazard reduction, National Academy Press, Washington D.C., 1987.

3. Measuring vulnerability to natural hazards, Edited by: John Birkmann, United Nations University – Institute for Environment and Human Security UNU-EHS, Published in India by TERI Press, New Delhi, 2006.
4. National policy on disaster management, NDMA website.
5. Pardeep Sahni, Alka Dhameja and Uma Meduri, Disaster mitigation – Experiences and reflections, Prentice – Hall India Pvt. Ltd., New Delhi. 2001.
6. Christina Bollin and Shivani Khanna, “Review of post disaster recovery needs assessment and methodologies – Experiences from Asia and Latin America”, Report commissioned by UNDP, November 2007, ola.almgren@undp.org, 110 pages.
7. “Condition assessment of buildings for repair and upgrading’, Report prepared under GOI-UNDP Disaster, Risk Management Programme, National Disaster Management Division, Ministry of Home Affairs, Govt. of India, New Delhi, June 2007.
8. Coburn, A and Spence, R. (1992), *Earthquake Protection*, John Wiley & Sons.
9. UNDRO, *Natural Disaster and Vulnerability Analysis: Report of Expert Group Meeting*, Office of United Nations Disaster Relief Co-ordinator (UNDRO), Palais des Nations, CH-1211 Geneva 10, Switzerland, 1979.
10. Prem Krishna, (2004), “Wind Disaster Mitigation Measures in India”, International Workshop on Wind Engineering and Science, WES-04, pp 44-51

612CEP01 - ENVIRONMENTAL AND IRRIGATION ENGINEERING DRAWING

UNIT I WATER SUPPLY AND TREATMENT

Design & Drawing of flash mixer, flocculator, clarifier – Rapid sand filter – Service reservoirs – Pumping station – House service connection for water supply and drainage.

UNIT II SEWAGE TREATMENT & DISPOSAL

Design and Drawing of screen chamber - Grit channel - Primary clarifier - Activated sludge process – Aeration tank – Secondary clarifiers – Sludge digester – Sludge drying beds – Waste stabilisation ponds - Septic tanks and disposal arrangements – Manholes.

UNIT III IMPOUNDING STRUCTURES

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

UNIT IV CANAL TRANSMISSION STRUCTURES

Aqueducts – Syphon Aqueducts – Super passage – Canal siphon – Canal Drops- Drawing showing plan, elevation and foundation details.

UNIT V CANAL REGULATION STRUCTURES

Canal head works- Canal Regulator – Canal escape- Proportional Distributors – Drawing showing detailed plan, elevation and foundation.

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 StructuresI", 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.

612CEP02 - ENVIRONMENTAL ENGINEERING LABORATORY

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) PH 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)

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 EQUIPMENT
(For a batch of 30 students)

1.	PH 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 / Crucibles	- 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	- 1 Lot

612CEP03 - SURVEY CAMP

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)

SEVENTH SEMESTER

712CET01 - DESIGN OF REINFORCED CONCRETE & BRICK MASONRY STRUCTURES

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

Design of cantilever and counter fort retaining walls

UNIT II WATER TANKS

Underground rectangular tanks – Domes – Overhead circular and rectangular tanks – Design of staging and foundations

UNIT III SELECTED TOPICS

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

Application of virtual work method to square, rectangular, circular and triangular slabs.

UNIT V BRICK MASONRY

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

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.

712CET02 - ESTIMATION AND QUANTITY SURVEYING

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

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

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

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

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

UNIT V REPORT PREPARATION

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

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

REFERENCE

1. PWD Data Book.

712CET03 - BASICS OF DYNAMICS AND ASEISMIC DESIGN

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

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

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

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

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

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.

TEXT BOOK

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 NPEEE Publications.

712CET04 - PRESTRESSED CONCRETE STRUCTURE

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

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

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

Design of prestressed concrete tanks – Pipes.

UNIT IV COMPOSITE CONSTRUCTION

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

UNIT V PRE-STRESSED CONCRETE BRIDGES

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

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.

ELECTIVE II & III

712CET05 - TRAFFIC ENGINEERING AND MANAGEMENT

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

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

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

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

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

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

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.

712CET06 - HOUSING PLANNING AND MANAGEMENT

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

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

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

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

UNIT IV CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS

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

UNIT V HOUSING FINANCE AND PROJECT APPRAISAL

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

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.

712CET07 - GROUND WATER ENGINEERING

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

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

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

UNIT III ESTIMATION OF PARAMETERS

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

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

UNIT V WATER QUALITY

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

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.

712CET08 - MANAGEMENT OF IRRIGATION SYSTEMS

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

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

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

UNIT III MANAGEMENT

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

UNIT IV OPERATION

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

UNIT V INVOLVEMENT OF STAKE HOLDERS

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

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.

712CET09 - COASTAL ZONE MANAGEMENT

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

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

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

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

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

UNIT V HARBOURS

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

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".

712CET10 - WATER RESOURCES ENGINEERING

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

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

Hydrologic measurements – Analysis of hydrologic data – Hydrologic station network – Station network design – Statistical techniques in network design.

UNIT III WATER RESOURCE NEEDS

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

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

Estimation of cost and Evaluation of Benefits - Discount rate - Discounting factors – Discounting techniques – Computer Applications.

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.

712CET11 - PAVEMENT ENGINEERING

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

Introduction - Pavement as layered structure - Pavement types - flexible and rigid -Stress and deflections in pavements under repeated loading

UNIT II DESIGN OF FLEXIBLE PAVEMENTS

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

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

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

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.

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. Yoder R.J and Witczak M.W., "Principles of Pavement Design", John Wiley, 1975.

REFERENCES

1. Design and Specification of Rural Roads (Manual), Ministry of rural roads, Government of India, New Delhi, 2001.
2. Guidelines for the Design of Flexible Pavements, IRC:37 - 2001, The Indian roads Congress, New Delhi.
3. Guideline for the Design of Rigid Pavements for Highways, IRC:58-1998, The Indian Roads Congress, New Delhi.

712CET12 - GROUND IMPROVEMENT TECHNIQUES

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

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

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

UNIT III INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS

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

UNIT IV EARTH REINFORCEMENT

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

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

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 Blackie Academic and Professional, Chapman and Hall, Glassgow, 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.

712CET13 - INTRODUCTION TO SOIL DYNAMICS AND MACHINE FOUNDATIONS

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

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

UNIT II WAVES AND WAVE PROPAGATION

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

UNIT III DYNAMIC PROPERTIES OF SOILS

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 soilcodal provisions.

UNIT IV DESIGN PROCEDURES

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

UNIT V VIBRATION ISOLATION

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

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.

712CET14 - ROCK ENGINEERING

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

Geological classification – Index properties of rock systems – Classification of rock masses for engineering purpose.

UNIT II ROCK STRENGTH AND FAILURE CRITERIA

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

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

Simple engineering application – Underground openings – Rock slopes – Foundations and mining subsidence.

UNIT V ROCK BOLTING

Introduction – Rock bolt systems – rock bolt installation techniques – Testing of rock bolts – Choice of rock bolt based on rock mass condition.

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.
2. Hock E. and Bray J., "Rock Slope Engineering, Institute of Mining and Metallurgy", 1991.

712CET15 - ENVIRONMENTAL IMPACT ASSESSMENT OF CIVIL ENGINEERING PROJECTS

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

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

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

UNIT III PREDICTION AND ASSESSMENT

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

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

EIA for infrastructure projects - Bridges - Stadium - Highways - Dams - Multi-storey Buildings - Water Supply and Drainage Projects - Waste water treatment plants.

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.

712CET16 - INDUSTRIAL WASTE MANAGEMENT

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

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

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

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

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

Hazardous wastes - Physico chemical treatment – solidification – incineration – Se cure la and fills.

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.

712CET17 - AIR POLLUTION MANAGEMENT

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

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

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

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

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

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

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 York, 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.

712CET18 - MUNICIPAL SOLID WASTE MANAGEMENT

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

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

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

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

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

UNIT V DISPOSAL

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

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.

712CET19 - ECOLOGICAL ENGINEERING

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

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

UNIT II ECOSYSTEM FUNCTIONS

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

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

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

UNIT V CASE STUDIES

Case studies of integrated ecological engineering systems.

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.

712CET20 - CONTRACT LAWS AND REGULATIONS

UNIT I CONSTRUCTION CONTRACTS

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

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

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

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

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.

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.

712CET21 - DESIGN AND CONSTRUCTION OF PRECAST CONCRETE STRUCTURES

Objective:

The objective of this course is to make aware of the various techniques for industrialised construction and precast concrete structures, design procedures, production and construction methods.

UNIT – I PRECAST CONCRETE SYSTEMS

Industrialised construction - Prefabricated Construction – Advantages - Classification of Prefabricated Systems - Tunnel Form Construction - Slip form construction.

Precast concrete systems - Waffle shell system for floors and roofs - Precast RCC joists and Filler Blocks System – Precast reinforced or prestressed concrete channel units – Plate floor system - Precast prestressed slab elements using hollow clay blocks and concrete – Precast hollow core slabs – Precast concrete double tees – Large panel prefabrication – Tilt-up system – Lift slab system – Box units – Precast concrete industrial roof units – Precast frame systems – Precast ferrocement units.

UNIT – II DESIGN CONSIDERATIONS FOR PRECAST CONCRETE STRUCTURES

Design criteria – Modular co-ordination, standardization and tolerances - Design of Precast units – Lifting devices – Bracing - Design of joints – Design criteria – Structural considerations – Types of joints – Column to base connections – Column to column connections – Beam to column connections – Beam to beam connections – Water tightness of joints Sealants - - Earthquake resistant design – Design requirements for safety against progressive collapse – Design of ties – Bearing of precast units - Testing of precast concrete components.

UNIT – III PRODUCTION TECHNIQUES FOR PRECAST CONCRETE PRODUCTS

Production facility for on-site and factory production – Intermittent or continuous casting with stationery moulds - The concreting plant is stationery, the mould is moved. - Precasting with horizontal stationery moulds - Precasting system based on circulating moulds - Production of wall units in single vertical moulds - Production of wall panels in vertical battery moulds - Long line methods of production with a travelling casting gantry - Form work for precast concrete – Material for precast forms/moulds – Design considerations – Formwork for precast wall panels, columns and beams – Prestressed concrete sleepers.

UNIT – IV CONSTRUCTION TECHNIQUES

Storage of precast units – handling of precast units – Transport of precast units – Cranes and handling equipment – lifting clamps and lifting devices - Erection preparation - Erection safety - Erection sequence- Temporary fixing and bracing of wall units after erection – Scaffolding – Erection and assembly of wall units and floor units – Sequencing of building operations – Safety precautions.

UNIT – V ARCHITECTURAL PRECAST CONCRETE

Advantages of architectural precast concrete – Application of architectural precast concrete – Repetition and tooling – Decorative concrete – Design considerations – Joints – Types of joints – Sealants – Expansion joints - Cold Weather Sealant Applications – Glass fiber reinforced concrete panels.

TEXT BOOKS

1. Gyula Sebestyen, Large panel buildings, Akademiai Kiado, Publishing house of The Hungarian Academy of Sciences, Budapest, 1965.
2. Nissen H., Industrialised building and modular design, Cement and Concrete Association, London, May 1972.
3. Koncz T., Manual of precast concrete construction, Vol. 1 & 2, Bauverlag GmbH, Wiesbaden and Berlin, 1971.
4. Lewicki, Bohdan, Building with Large Prefabricates, Elsevier Publishing Company, New York, 1966.
5. Design and construction of precast concrete structures, Proceedings National Workshop, Eds. Dr.D.S.Ramachandra Murthy and Dr.P.Partheeban, St. Peter’s College of Engineering and Technology, Chennai, January 28-30, 2013.

REFERENCES

11. National Building Code of India 2005, Part 6 Structural Design, Section 7 – Prefabrication, Systems Building and Mixed Composite Construction, Bureau of Indian Standards, New Delhi.
12. PCI Manual for the design of hollow core slabs, Precast/Prestressed concrete Institute, Chicago, U.S.A., 1998.
13. Joseph J.Waddell, Precast concrete: Handling and Erection, Jointly published by The Iowa State University Press, AMES, Iowa and American Concrete Institute, 1974.
14. Proc.of Symposium on precast concrete wall panels, ACI Publication SP-11, March 4, 1964.
15. State of the art report on Ferrocement, ACI 549R-97, ACI Manual of Concrete Practice 2000, Part 5, American Concrete Institute.
16. Guide for the design, construction and repair of ferrocement, ACI 549.1R-93, ACI Manual of Concrete Practice 2000, Part 5, American Concrete Institute.
17. *Ferrocement – Materials and Applications*, ACI Special Publication SP-61, American Concrete Institute, 1979.
18. Architectural precast concrete, Prestressed Concrete Institute, Chicago, 1973.
19. Architectural precast concrete joint details, Reported by PCI Committee on Architectural Precast Concrete Joint Details, Prestressed Concrete Institute, 1973.
20. Precast concrete connection details, Structural Design Manual, Stupre’ – Society for Studies on the use of precast concrete, Netherlands, Beton – Verlag GmbH,1978.
21. Approved code of practice for the safe handling, transportation and erection of precast concrete, Published by the Occupational Safety and Health Service, Department of Labour, Wellington, New Zealand, May 2002.
22. Code of practice for precast concrete construction 2003, Prepared by Buildings Department, Government of Hongkong, Mongkok, Kowloon, Hong Kong, October 2003.
23. Tests for precast wall panels, Reported by Subcommittee V, ACI Committee 533, Journal of American Concrete Institute, Vol.61, No.4, April 1964, pp.369-382. Tests for precast wall panels, Reported by Subcommittee V, ACI Committee 533, Journal of American Concrete Institute, Vol.61, No.4, April 1964, pp.369-382.

712CEP01 - COMPUTER AIDED DESIGN & DRAFTING LABORATORY

OBJECTIVES

- 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.

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. 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. |

712CEP02 - DESIGN PROJECT

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.

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)

EIGHTH SEMESTER
812CET01 - ENGINEERING ECONOMICS AND COST ANALYSIS

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

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

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

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

UNIT IV FINANCING

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

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 - payback 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.

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

ELECTIVE IV & V

812CET02 - BRIDGE STRUCTURES

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

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

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

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

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

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.

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.

812CET03 - STORAGE STRUCTURES

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

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

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 underground tanks – Design of base slab and side wall – Check for uplift.

UNIT III STEEL BUNKERS AND SILOS

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

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

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

TEXT BOOKS

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

812CET04 - DESIGN OF PLATE AND SHELL STRUCTURES

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

Laterally loaded thin plates – governing differential equations – Simply supported and fixed boundary conditions.

UNIT II RECTANGULAR PLATES

Simply supported rectangular plates – Navier’s solution and Levy’s method.

UNIT III THIN SHELLS

Classification of shells-structural actions – membrane theory.

UNIT IV ANALYSIS OF SHELLS

Analysis of spherical dome – cylindrical shells – folded plates.

UNIT V DESIGN OF SHELLS

Design of spherical dome – cylindrical shells – folded plates.

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 Publishers, 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.

812CET05 - TALL BUILDINGS

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

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

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

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 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

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

TEXT BOOKS

1. Woltang 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.

812CET06 - PREFABRICATED STRUCTURES

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

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

UNIT II PREFABRICATED COMPONENTS

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

UNIT III DESIGN PRINCIPLES

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

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

UNIT V DESIGN FOR ABNORMAL LOADS

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

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.

812CET07 - WIND ENGINEERING

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

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

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

UNIT III EFFECT ON TYPICAL STRUCTURES

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

UNIT IV APPLICATION TO DESIGN

Design forces on multistorey building, towers and roof trusses.

UNIT V INTRODUCTION TO WIND TUNNEL

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

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, Ottawa, 1990.
2. Wind Force on Structures – Course Notes, Building Technology Centre, Anna University, 1995.

812CET08 - COMPUTER AIDED DESIGN OF STRUCTURE

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

Fundamentals of CAD - Hardware and software requirements -Design process – Applications and benefits.

UNIT II COMPUTER GRAPHICS

Graphic primitives - Transformations -Wire frame modeling and solid modeling –Graphic standards – Drafting packages

UNIT III STRUCTURAL ANALYSIS

Fundamentals of finite element analysis - Principles of structural analysis -Analysis packages and applications.

UNIT IV DESIGN AND OPTIMISATION

Principles of design of steel and RC Structures -Applications to simple design problems – Optimisation techniques - Algorithms - Linear Programming – Simplex method.

UNIT V EXPERT SYSTEMS

Introduction to artificial intelligence - Knowledge based expert systems -Rules and decision tables – Inference mechanisms - Simple applications.

TEXT BOOKS

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

REFERENCES

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

812CET09 - INDUSTRIAL STRUCTURES

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

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

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

UNIT III DESIGN OF STEEL STRUCTURES

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

UNIT IV DESIGN OF R.C. STRUCTURES

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

UNIT V PREFABRICATION

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

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 Bouverlay GMBH, 1971.

812CET10 - SMART MATERIALS AND SMART STRUCTURES

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

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

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

UNIT III SENSORS

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

UNIT IV ACTUATORS

Actuator Techniques – Actuator and actuator materials – Piezoelectric and Electrostrictive Material – Magnetostructure Material – Shape Memory Alloys – Electro rheological Fluids– Electromagnetic actuation – Role of actuators and Actuator Materials.

UNIT V SIGNAL PROCESSING AND CONTROL SYSTEMS

Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors – Signal Processing – Control System – Linear and Non- Linear.

TEXT BOOKS

1. Brain Culshaw – Smart Structure and Materials Artech House – Borton. London- 1996.
2. Srinivasan ,A.V and Michael McFarland . D, " Smart Structures – Analysis and Design , Cambridge University Press, 2001.

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.

812CET11 - FINITE ELEMENT TECHNIQUES

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

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

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

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

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

UNIT V APPLICATIONS TO FIELD PROBLEMS IN TWO DIMENSIONALS

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

TEXT BOOK

1. Chandrupatla, T.R., and Belegundu, A.D., "Introduction to Finite Element in Engineering", Third Edition, Prentice Hall, India, 2003.
2. Bhavikati , S.S., "Finite Element Analysis ", New Age International Publishers , 2005.

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.

812CET12 - REPAIR AND REHABILITATION OF STRUCTURES

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

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

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

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

Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, Guniting 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

Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure.

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. Lakshmiathy, M. etal. Lecture notes of Workshop on "Repairs and Rehabilitation of Structures", 29 - 30th October 1999.

812CEP01 - PROJECT WORK

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)

Registrar