ANNA UNIVERSITY, CHENNAI
AFFILIATED INSTITUTIONS
R - 2013
B. E. CIVIL ENGINEERING
I TO VIII SEMESTERS CURRICULUM & SYLLABUS

SEMESTER I

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* Survey Camp to be conducted for a period of 2 weeks during 4\(^{th}\) Semester Summer Vacation

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## ELECTIVE II

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### ELECTIVE V

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OBJECTIVES:

- To enable learners of Engineering and Technology develop their basic communication skills in English.
- To emphasize specially the development of speaking skills amongst learners of Engineering and Technology.
- To ensure that learners use the electronic media such as internet and supplement the learning materials used in the classroom.
- To inculcate the habit of reading and writing leading to effective and efficient communication.

UNIT I
Listening - Introducing learners to GIE - Types of listening - Listening to audio (verbal & sounds); Speaking - Speaking about one’s place, important festivals etc. – Introducing oneself, one’s family / friend; Reading - Skimming a reading passage – Scanning for specific information - Note-making; Writing - Free writing on any given topic (My favourite place / Hobbies / School life, etc.) - Sentence completion - Autobiographical writing (writing about one’s leisure time activities, hometown, etc.); Grammar - Prepositions - Reference words - Wh-questions - Tenses (Simple); Vocabulary - Word formation - Word expansion (root words / etymology); E-materials - Interactive exercises for Grammar & Vocabulary - Reading comprehension exercises - Listening to audio files and answering questions.

UNIT II
Listening - Listening and responding to video lectures / talks; Speaking - Describing a simple process (filling a form, etc.) - Asking and answering questions - Telephone skills – Telephone etiquette; Reading – Critical reading - Finding key information in a given text - Sifting facts from opinions; Writing - Biographical writing (place, people) - Process descriptions (general/specific) - Definitions - Recommendations – Instructions; Grammar - Use of imperatives - Subject-verb agreement; Vocabulary - Compound words - Word Association (connotation); E-materials - Interactive exercises for Grammar and Vocabulary - Listening exercises with sample telephone conversations / lectures – Picture-based activities.

UNIT III
Listening - Listening to specific task - focused audio tracks; Speaking - Role-play – Simulation - Group interaction - Speaking in formal situations (teachers, officials, foreigners); Reading - Reading and interpreting visual material; Writing - Jumbled sentences - Coherence and cohesion in writing - Channel conversion (flowchart into process) - Types of paragraph (cause and effect / compare and contrast / narrative / analytical) - Informal writing (letter/e-mail/blogs) - Paraphrasing; Grammar - Tenses (Past) - Use of sequence words - Adjectives; Vocabulary - Different forms and uses of words, Cause and effect words; E-materials - Interactive exercises for Grammar and Vocabulary - Excerpts from films related to the theme and follow up exercises - Pictures of flow charts and tables for interpretations.

UNIT IV
Listening - Watching videos / documentaries and responding to questions based on them; Speaking - Responding to questions - Different forms of interviews - Speaking at different types of interviews; Reading - Making inference from the reading passage - Predicting the content of a reading passage; Writing - Interpreting visual materials (line graphs, pie charts etc.) - Essay writing – Different types of essays; Grammar - Adverbs – Tenses – future time reference; Vocabulary - Single word substitutes - Use of abbreviations and acronyms; E-materials - Interactive exercises for Grammar and Vocabulary - Sample interviews - film scenes - dialogue writing.
UNIT V

Listening - Listening to different accents, Listening to Speeches/Presentations, Listening to broadcast and telecast from Radio and TV; Speaking - Giving impromptu talks, Making presentations on given topics; Reading - Email communication - Reading the attachment files having a poem/joke/proverb - Sending their responses through email; Writing - Creative writing, Poster making; Grammar - Direct and indirect speech; Vocabulary - Lexical items (fixed / semi fixed expressions); E-materials - Interactive exercises for Grammar and Vocabulary - Sending emails with attachment – Audio / video excerpts of different accents - Interpreting posters.

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

OUTCOMES:
Learners should be able to

- speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
- write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
- read different genres of texts adopting various reading strategies.
- listen/view and comprehend different spoken discourses/excerpts in different accents

TEXTBOOKS:

REFERENCES:

EXTENSIVE Reading (Not for Examination)

WEBSITES:

TEACHING METHODS:

- Lectures
- Activities conducted individually, in pairs and in groups like self introduction, peer introduction, group poster making, grammar and vocabulary games, etc.
- Discussions
- Role play activities
- Short presentations
- Listening and viewing activities with follow up activities like discussion, filling up worksheets, writing exercises (using language lab wherever necessary/possible) etc.

EVALUATION PATTERN:

Internal assessment: 20%
3 tests of which two are pen and paper tests and the other is a combination of different modes of assessment like
All the four skills are to be tested with equal weightage given to each.

- Speaking assessment: Individual speaking activities, Pair work activities like role play, Interview, Group discussions
- Reading assessment: Reading passages with comprehension questions graded from simple to complex, from direct to inferential
- Writing assessment: Writing paragraphs, essays etc. Writing should include grammar and vocabulary.
- Listening/Viewing assessment: Lectures, dialogues, film clippings with questions on verbal as well as audio/visual content.

End Semester Examination: 80%

MA6151 MATHEMATICS – I

OBJECTIVES:

- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- To make the student knowledgeable in the area of infinite series and their convergence so that he/ she will be familiar with limitations of using infinite series approximations for solutions arising in mathematical modeling.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To introduce the concepts of improper integrals, Gamma, Beta and Error functions which are needed in engineering applications.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I MATRICES

9+3

UNIT II SEQUENCES AND SERIES

9+3

UNIT III APPLICATIONS OF DIFFERENTIAL CALCULUS

9+3
Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes - Evolute as envelope of normals.

UNIT IV DIFFERENTIAL CALCULUS OF SEVERAL VARIABLES

9+3
UNIT V          MULTIPLE INTEGRALS
9+3
Double integrals in cartesian and polar coordinates – Change of order of integration – Area
enclosed by plane curves – Change of variables in double integrals – Area of a curved surface -
Triple integrals – Volume of Solids.

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

OUTCOMES:
• This course equips students to have basic knowledge and understanding in one fields of
materials, integral and differential calculus.

TEXTBOOKS:
2011.

REFERENCES:
Ltd., 2011.
2012.
Company, New Delhi, 2008.
5. Sivarama Krishna Das P. and Rukmangadachari E., “Engineering Mathematics”, Volume I,

PH6151          ENGINEERING PHYSICS – I          L T P C
3 0 0 3

OBJECTIVES:
• To enhance the fundamental knowledge in Physics and its applications relevant to various
streams of Engineering and Technology.

UNIT I          CRYSTAL PHYSICS
9
Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice –
Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing
factor for SC, BCC, FCC and HCP structures – Diamond and graphite structures (qualitative
treatment) - Crystal growth techniques –solution, melt (Bridgman and Czochralski) and vapour
growth techniques (qualitative)

UNIT II          PROPERTIES OF MATTER AND THERMAL PHYSICS
9
Elasticity- Hooke’s law - Relationship between three modulii of elasticity (qualitative) – stress
strain diagram – Poisson’s ratio –Factors affecting elasticity –Bending moment – Depression of a
cantilever –Young’s modulus by uniform bending- I-shaped girders
Modes of heat transfer- thermal conductivity- Newton’s law of cooling - Linear heat flow – Lee’s
disc method – Radial heat flow – Rubber tube method – conduction through compound media
(series and parallel)

UNIT III          QUANTUM PHYSICS
9
Black body radiation – Planck’s theory (derivation) – Deduction of Wien’s displacement law and
Rayleigh – Jeans’ Law from Planck’s theory – Compton effect. Theory and experimental
verification – Properties of Matter waves – G.P Thomson experiment -Schrödinger’s wave
equation – Time independent and time dependent equations – Physical significance of wave
function – Particle in a one dimensional box - Electron microscope - Scanning electron microscope
- Transmission electron microscope.
UNIT IV  ACOUSTICS AND ULTRASONICS  
Production of ultrasounds by magnetostriction and piezoelectric methods - acoustic grating -Non Destructive Testing – pulse echo system through transmission and reflection modes – A,B and C – scan displays, Medical applications - Sonogram

UNIT V  PHOTONICS AND FIBRE OPTICS  
Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle - Types of optical fibres (material, refractive index, mode) – attenuation, dispersion, bending - Fibre Optical Communication system (Block diagram) - Active and passive fibre sensors- Endoscope.

OUTCOMES:
- The students will have knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications.

TEXTBOOKS:
1. Arumugam M. Engineering Physics, Anuradha publishers, 2010

REFERENCES:
1. Sears and Zemansky. University Physics, 2009
5. Rajagopal K. Engineering Physics, PHI, New Delhi, 2011

CY6151  ENGINEERING CHEMISTRY - I  
L T P C  3 0 0 3

OBJECTIVES:
- To make the students conversant with basics of polymer chemistry.
- To make the student acquire sound knowledge of second law of thermodynamics and second law based derivations of importance in engineering applications in all disciplines.
- To acquaint the student with concepts of important photophysical and photochemical processes and spectroscopy.
- To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.
- To acquaint the students with the basics of nano materials, their properties and applications.

UNIT I  POLYMER CHEMISTRY  
Introduction: Classification of polymers – Natural and synthetic; Thermoplastic and Thermosetting.
Functionality – Degree of polymerization. Types and mechanism of polymerization: Addition (Free Radical, cationic and anionic); condensation and copolymerization. Properties of polymers: Tg, Tacticity, Molecular weight – weight average, number average and polydisperisty index.
Techniques of polymerization: Bulk, emulsion, solution and suspension. Preparation, properties and uses of Nylon 6,6, and Epoxy resin.
UNIT II CHEMICAL THERMODYNAMICS
Terminology of thermodynamics - Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Helmholtz and Gibbs free energy functions (problems); Criteria of spontaneity; Gibbs-Helmholtz equation (problems); Clausius-Clapeyron equation; Maxwell relations – Van’t Hoff isotherm and isochores (problems).

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY

UNIT IV PHASE RULE AND ALLOYS

UNIT V NANO CHEMISTRY
Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoparticles: nano cluster, nano rod, nanotube (CNT) and nanowire. Synthesis: precipitation, thermolysis, hydrothermal, solvothermal, electrode position, chemical vapour deposition, laser ablation; Properties and applications.

TOTAL 45 PERIODS

OUTCOMES:
- The knowledge gained on polymer chemistry, thermodynamics, spectroscopy, phase rule and nano materials will provide a strong platform to understand the concepts on these subjects for further learning.

TEXTBOOKS:

REFERENCES:
OBJECTIVES:
The students should be made to:
- Learn the organization of a digital computer.
- Be exposed to the number systems.
- Learn to think logically and write pseudo code or draw flow charts for problems.
- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.

UNIT I  INTRODUCTION

UNIT II  C PROGRAMMING BASICS

UNIT III  ARRAYS AND STRINGS

UNIT IV  FUNCTIONS AND POINTERS

UNIT V  STRUCTURES AND UNIONS
Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.

OUTCOMES:
At the end of the course, the student should be able to:
- Design C Programs for problems.
- Write and execute C programs for simple applications.

TEXTBOOKS:

REFERENCES:
OBJECTIVES:
- To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products.
- To 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  
Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

UNIT II  
PROJECTION OF POINTS, LINES AND PLANE SURFACES  
Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III  
PROJECTION OF SOLIDS  
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method and auxiliary plane method.

UNIT IV  
PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES  
Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes

UNIT V  
ISOMETRIC AND PERSPECTIVE PROJECTIONS  
Principles of isometric projection – isometric scale – Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method .

COMPUTER AIDED DRAFTING (Demonstration Only)  
Introduction to drafting packages and demonstration of their use.

OUTCOMES:
On Completion of the course the student will be able to
- perform free hand sketching of basic geometrical constructions and multiple views of objects.
- do orthographic projection of lines and plane surfaces.
- draw projections and solids and development of surfaces.
- prepare isometric and perspective sections of simple solids.
- demonstrate computer aided drafting.

TOTAL : 75 PERIODS
TEXTBOOK:

REFERENCES:

Publication of Bureau of Indian Standards:

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. The examination will be conducted in appropriate sessions on the same day.

GE6161 COMPUTER PRACTICES LABORATORY

OBJECTIVES:
The student should be made to:
- Be familiar with the use of Office software.
- Be exposed to presentation and visualization tools.
- Be exposed to problem solving techniques and flow charts.
- Be familiar with programming in C.
- Learn to use Arrays, strings, functions, structures and unions.

LIST OF EXPERIMENTS:
- Search, generate, manipulate data using MS office/ Open Office
- Presentation and Visualization – graphs, charts, 2D, 3D
- Problem formulation, Problem Solving and Flowcharts
- C Programming using Simple statements and expressions
- Scientific problem solving using decision making and looping.
- Simple programming for one dimensional and two dimensional arrays.
- Solving problems using String functions
- Programs with user defined functions – Includes Parameter Passing
- Program using Recursive Function and conversion from given program to flow chart.
- Program using structures and unions.

TOTAL : 45 PERIODS
OUTCOMES:
At the end of the course, the student should be able to:

- Apply good programming design methods for program development.
- Design and implement C programs for simple applications.
- Develop recursive programs.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS:

Standalone desktops with C compiler 30 Nos.
(or)
Server with C compiler supporting 30 terminals or more.

GE6162 ENGINEERING PRACTICES LABORATORY

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
5. Measurement of energy using single phase energy meter.

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.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL: 45 PERIODS

OUTCOMES:
• ability to fabricate carpentry components and pipe connections including plumbing works.
• ability to use welding equipments to join the structures.
• ability to fabricate electrical and electronics circuits.

REFERENCES:

LIST OF EQUIPMENT 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.
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.
5. Study purpose items: Telephone, FM radio, low-voltage power supply

GE6163 PHYSICS AND CHEMISTRY LABORATORY – I      L T P C
0 0 2 1

PHYSICS LABORATORY – I

OBJECTIVES:
• To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics and properties of matter.

LIST OF EXPERIMENTS
(Any FIVE Experiments)
1. (a) Determination of Wavelength, and particle size using Laser
   (b) Determination of acceptance angle in an optical fiber.
2. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
3. Determination of wavelength of mercury spectrum – spectrometer grating
5. Determination of Young’s modulus by Non uniform bending method
6. Determination of specific resistance of a given coil of wire – Carey Foster’s Bridge
OUTCOMES:
- The hands on exercises undergone by the students will help them to apply physics principles of optics and thermal physics to evaluate engineering properties of materials.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Diode laser, lycopodium powder, glass plate, optical fiber.
2. Ultrasonic interferometer
3. Spectrometer, mercury lamp, grating
4. Lee’s Disc experimental set up
5. Traveling microscope, meter scale, knife edge, weights
6. Carey foster’s bridge set up
   (vernier Caliper, Screw gauge, reading lens are required for most of the experiments)

CHEMISTRY LABORATORY- I

OBJECTIVES:
- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To acquaint the students with the determination of molecular weight of a polymer by vacometry.

LIST OF EXPERIMENTS
(Any FIVE Experiments)

1. Determination of DO content of water sample by Winkler’s method.
2. Determination of chloride content of water sample by argentometric method.
3. Determination of strength of given hydrochloric acid using pH meter.
4. Determination of strength of acids in a mixture using conductivity meter.
5. Estimation of iron content of the water sample using spectrophotometer.
   (1,10- phenanthroline / thiocyanate method).
7. Conductometric titration of strong acid vs strong base.

OUTCOMES:
- The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

REFERENCES:

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Iodine flask - 30 Nos
2. pH meter - 5 Nos
3. Conductivity meter - 5 Nos
4. Spectrophotometer - 5 Nos
5. Ostwald Viscometer - 10 Nos

Common Apparatus : Pipette, Burette, conical flask, percelain tile, dropper (each 30 Nos.)
OBJECTIVES:
- To make learners acquire listening and speaking skills in both formal and informal contexts.
- To help them develop their reading skills by familiarizing them with different types of reading strategies.
- To equip them with writing skills needed for academic as well as workplace contexts.
- To make them acquire language skills at their own pace by using e-materials and language lab components.

UNIT I 9+3
Listening - Listening to informal conversations and participating; Speaking - Opening a conversation (greetings, comments on topics like weather) - Turn taking - Closing a conversation (excuses, general wish, positive comment, thanks); Reading - Developing analytical skills, Deductive and inductive reasoning - Extensive reading; Writing - Effective use of SMS for sending short notes and messages - Using 'emoticons' as symbols in email messages; Grammar - Regular and irregular verbs - Active and passive voice; Vocabulary - Homonyms (e.g. 'can') - Homophones (e.g. 'some', 'sum'); E-materials - Interactive exercise on Grammar and vocabulary – blogging; Language Lab - Listening to different types of conversation and answering questions.

UNIT II 9+3
Listening - Listening to situation based dialogues; Speaking - Conversation practice in real life situations, asking for directions (using polite expressions), giving directions (using imperative sentences), Purchasing goods from a shop, Discussing various aspects of a film (they have already seen) or a book (they have already read); Reading - Reading a short story or an article from newspaper, Critical reading, Comprehension skills; Writing - Writing a review / summary of a story / article, Personal letter (Inviting your friend to a function, congratulating someone for his / her success, thanking one's friends / relatives); Grammar - modal verbs, Purpose expressions; Vocabulary - Phrasal verbs and their meanings, Using phrasal verbs in sentences; E-materials - Interactive exercises on Grammar and vocabulary, Extensive reading activity (reading stories / novels), Posting reviews in blogs - Language Lab - Dialogues (Fill up exercises), Recording students' dialogues.

UNIT III 9+3
Listening - Listening to the conversation - Understanding the structure of conversations; Speaking - Conversation skills with a sense of stress, intonation, pronunciation and meaning - Seeking information – expressing feelings (affection, anger, regret, etc.); Reading - Speed reading – reading passages with time limit - Skimming; Writing - Minutes of meeting – format and practice in the preparation of minutes - Writing summary after reading articles from journals - Format for journal articles – elements of technical articles (abstract, introduction, methodology, results, discussion, conclusion, appendices, references) - Writing strategies; Grammar - Conditional clauses - Cause and effect expressions; Vocabulary - Words used as nouns and verbs without any change in the spelling (e.g. 'rock', 'train', 'ring'); E-materials - Interactive exercise on Grammar and vocabulary - Speed Reading practice exercises; Language Lab - Intonation practice using EFLU and RIE materials – Attending a meeting and writing minutes.

UNIT IV 9+3
Listening - Listening to a telephone conversation, Viewing model interviews (face-to-face, telephonic and video conferencing); Speaking - Role play practice in telephone skills - listening and responding, -asking questions, -note taking – passing on messages, Role play and mock interview for grasping interview skills; Reading - Reading the job advertisements and the profile of the company concerned – scanning; Writing - Applying for a job – cover letter - résumé preparation – vision, mission and goals of the candidate; Grammar - Numerical expressions - Connectives (discourse markers); Vocabulary - Idioms and their meanings – using idioms in sentences; E-materials - Interactive exercises on Grammar and Vocabulary - Different forms of
résumés - Filling up a résumé / cover letter; Language Lab - Telephonic interview – recording the responses - e-résumé writing.

UNIT V

Listening - Viewing a model group discussion and reviewing the performance of each participant - Identifying the characteristics of a good listener; Speaking - Group discussion skills – initiating the discussion – exchanging suggestions and proposals – expressing dissent/agreement – assertiveness in expressing opinions – mind mapping technique; Reading - Note making skills – making notes from books, or any form of written materials - Intensive reading; Writing – Checklist - Types of reports – Feasibility / Project report – report format – recommendations / suggestions – interpretation of data (using charts for effective presentation); Grammar - Use of clauses; Vocabulary – Collocation; E-materials - Interactive grammar and vocabulary exercises - Sample GD - Pictures for discussion, Interactive grammar and vocabulary exercises; Language Lab - Different models of group discussion.

OUTCOMES:

Learners should be able to

- speak convincingly, express their opinions clearly, initiate a discussion, negotiate, argue using appropriate communicative strategies.
- write effectively and persuasively and produce different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
- read different genres of texts, infer implied meanings and critically analyse and evaluate them for ideas as well as for method of presentation.
- listen/view and comprehend different spoken excerpts critically and infer unspoken and implied meanings.

TEXTBOOKS:


REFERENCES:


EXTENSIVE Reading (Not for Examination)


Websites

2. http://owl.english.purdue.edu

TEACHING METHODS:

- Lectures
- Activities conducted individually, in pairs and in groups like individual writing and presentations, group discussions, interviews, reporting, etc
- Long presentations using visual aids
- Listening and viewing activities with follow up activities like discussions, filling up worksheets, writing exercises (using language lab wherever necessary/possible) etc
Projects like group reports, mock interviews etc using a combination of two or more of the language skills

**EVALUATION PATTERN:**

**Internal assessment: 20%**

3 tests of which two are pen and paper tests and the other is a combination of different modes of assessment like

- Project
- Assignment
- Report
- Creative writing, etc.

All the four skills are to be tested with equal weightage given to each.

- Speaking assessment: Individual presentations, Group discussions
- Reading assessment: Reading passages with comprehension questions graded following Bloom’s taxonomy
- Writing assessment: Writing essays, CVs, reports etc. Writing should include grammar and vocabulary.
- Listening/Viewing assessment: Lectures, dialogues, film clippings with questions on verbal as well as audio/visual content graded following Bloom’s taxonomy.

**End Semester Examination: 80%**

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**MA6251 MATHEMATICS – II**

**OBJECTIVES:**

- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To acquaint the student with the concepts of vector calculus needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

**UNIT I 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 parallelopipeds.

**UNIT II 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 III LAPLACE TRANSFORM**

UNIT IV AN ANALYTIC FUNCTIONS

Functions of a complex variable – Analytic functions: Necessary conditions – Cauchy-Riemann equations and sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping: \( w = z+k, \, kz, \, 1/z, \, z^2, \, e^z \) and bilinear transformation.

UNIT V COMPLEX INTEGRATION

Complex integration – Statement and applications of Cauchy’s integral theorem and Cauchy’s integral formula – Taylor’s and Laurent’s series expansions – Singular points – Residues – Cauchy’s residue theorem – Evaluation of real definite integrals as contour integrals around unit circle and semi-circle (excluding poles on the real axis).

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

OUTCOMES:

- The subject helps the students to develop the fundamentals and basic concepts in vector calculus, ODE, Laplace transform and complex functions. Students will be able to solve problems related to engineering applications by using these techniques.

TEXTBOOKS:


REFERENCES:


PH6251 ENGINEERING PHYSICS – II

OBJECTIVES:

- To enrich the understanding of various types of materials and their applications in engineering and technology.

UNIT I CONDUCTING MATERIALS


UNIT II SEMICONDUCTING MATERIALS

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9
Superconductivity: properties – Type I and Type II superconductors – BCS theory of superconductivity(Qualitative) - High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

UNIT IV DIELECTRIC MATERIALS 9

UNIT V ADVANCED ENGINEERING MATERIALS 9

TOTAL: 45 PERIODS

OUTCOMES:
• The students will have the knowledge on physics of materials and that knowledge will be used by them in different engineering and technology applications.

TEXTBOOKS:

REFERENCES:

CY6251 ENGINEERING CHEMISTRY - II L T P C 3 0 0 3

OBJECTIVES:
• To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
• Principles of electrochemical reactions, redox reactions in corrosion of materials and methods for corrosion prevention and protection of materials.
• Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.
• Preparation, properties and applications of engineering materials.
• Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels.

UNIT I WATER TECHNOLOGY 9
Introduction to boiler feed water-requirements-formation of deposits in steam boilers and heat exchangers- disadvantages (wastage of fuels, decrease in efficiency, boiler explosion) prevention of scale formation -softening of hard water -external treatment zeolite and demineralization - internal treatment- boiler compounds (phosphate, calgon, carbonate, colloidal) - caustic embrittlement -boiler corrosion-priming and foaming- desalination of brackish water –reverse osmosis.
UNIT II  ELECTROCHEMISTRY AND CORROSION

UNIT III  ENERGY SOURCES
Introduction- nuclear energy- nuclear fission- controlled nuclear fission- nuclear fusion- differences between nuclear fission and fusion- nuclear chain reactions- nuclear reactor power generator-classification of nuclear reactor- light water reactor- breeder reactor- solar energy conversion- solar cells- wind energy. Batteries and fuel cells:Types of batteries- alkaline battery- lead storage battery- nickel-cadmium battery- lithium battery- fuel cell H₂ -O₂ fuel cell- applications.

UNIT IV  ENGINEERING MATERIALS
Abrasives: definition, classification or types, grinding wheel, abrasive paper and cloth. Refractories: definition, characteristics, classification, properties – refractoriness and RUL, dimensional stability, thermal spalling, thermal expansion, porosity; Manufacture of alumina, magnesite and silicon carbide, Portland cement- manufacture and properties - setting and hardening of cement, special cement- waterproof and white cement–properties and uses. Glass - manufacture, types, properties and uses.

UNIT V  FUELS AND COMBUSTION

TOTAL: 45 PERIODS

OUTCOMES:
• The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

TEXTBOOKS:
1. Vairam S, Kalyani P and SubaRamesh.,“Engineering Chemistry”,. Wiley India PvtLtd.,New Delhi., 2011

REFERENCES:
OBJECTIVES:
- To explain the basic theorems used in Electrical circuits and the different components and function of electrical machines.
- To explain the fundamentals of semiconductor and applications.
- To explain the principles of digital electronics
- To impart knowledge of communication.

UNIT I ELECTRICAL CIRCUITS & MEASUREMENTS 12
Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

UNIT II ELECTRICAL MECHANICS 12

UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS 12

UNIT IV DIGITAL ELECTRONICS 12
Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion (single concepts)

UNIT V FUNDAMENTALS OF COMMUNICATION ENGINEERING 12
Communication Systems: Radio, TV, Fax, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).

TOTAL: 60 PERIODS

OUTCOMES:
- ability to identify the electrical components explain the characteristics of electrical machines.
- ability to identify electronics components and use of them to design circuits.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering.

UNIT I  BASICS AND STATICS OF PARTICLES  12

UNIT II  EQUILIBRIUM OF RIGID BODIES  12

UNIT III  PROPERTIES OF SURFACES AND SOLIDS  12

UNIT IV  DYNAMICS OF PARTICLES  12

UNIT V  FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS  12
Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction–. Rolling resistance - Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

OUTCOMES:

- ability to explain the differential principles applies to solve engineering problems dealing with force, displacement, velocity and acceleration.
- ability to analyse the forces in any structures.
- ability to solve rigid body subjected to dynamic forces.

TEXTBOOKS:


REFERENCES:


GE6261 COMPUTER AIDED DRAFTING AND MODELING LABORATORY L T P C 0 1 2 2

OBJECTIVES:
• To develop skill to use software to create 2D and 3D models.

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,
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.

TOTAL: 45 PERIODS

OUTCOMES:
• ability to use the software packers for drafting and modeling
• ability to create 2D and 3D models of Engineering Components

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Description of Equipment</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Pentium IV computer or better hardware, with suitable graphics facility</td>
<td>30 No.</td>
</tr>
<tr>
<td>2.</td>
<td>Licensed software for Drafting and Modeling.</td>
<td>30 Licenses</td>
</tr>
<tr>
<td>3.</td>
<td>Laser Printer or Plotter to print / plot drawings</td>
<td>2 No.</td>
</tr>
</tbody>
</table>
OBJECTIVES:
- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics and properties of matter.

LIST OF EXPERIMENTS
(Any FIVE Experiments)
1. Determination of Young’s modulus by uniform bending method
2. Determination of band gap of a semiconductor
3. Determination of Coefficient of viscosity of a liquid – Poiseuille’s method
4. Determination of Dispersive power of a prism - Spectrometer
5. Determination of thickness of a thin wire – Air wedge method
6. Determination of Rigidity modulus – Torsion pendulum

OUTCOMES:
- The students will have the ability to test materials by using their knowledge of applied physics principles in optics and properties of matter.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
1. Traveling microscope, meter scale, Knife edge, weights
2. Band gap experimental set up
3. Burette, Capillary tube, rubber tube, stop clock, beaker and weighing balance
4. spectrometer, prism, sodium vapour lamp.
5. Air-wedge experimental set up.
6. Torsion pendulum set up.

(vernier Caliper, Screw gauge, reading lens are required for most of the experiments)

CHEMISTRY LABORATORY - II

OBJECTIVES:
- To make the student acquire practical skills in the wet chemical and instrumental methods for quantitative estimation of hardness, alkalinity, metal ion content, corrosion in metals and cement analysis.

LIST OF EXPERIMENTS
(Any FIVE Experiments)
1. Determination of alkalinity in water sample
2. Determination of total, temporary & permanent hardness of water by EDTA method
3. Estimation of copper content of the given solution by EDTA method
4. Estimation of iron content of the given solution using potentiometer
5. Estimation of sodium present in water using flame photometer
6. Corrosion experiment – weight loss method
7. Conductometric precipitation titration using BaCl₂ and Na₂SO₄

TOTAL: 30 PERIODS

OUTCOMES:
- The students will be conversant with hands-on knowledge in the quantitative chemical analysis of water quality related parameters, corrosion measurement and cement analysis.
REFERENCES:

- Laboratory classes on alternate weeks for Physics and Chemistry.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Potentiometer - 5 Nos
2. Flame photo meter - 5 Nos
3. Weighing Balance - 5 Nos
4. Conductivity meter - 5 Nos

Common Apparatus : Pipette, Burette, conical flask, percelain tile, dropper (30 Nos each)

MA6351 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS L T P C 3 1 0 4

OBJECTIVES:
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9+3
Formation of partial differential equations – Singular integrals -- Solutions of standard types of first order partial differential equations - Lagrange’s linear equation -- Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES 9+3

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9+3
Classification of PDE – Method of separation of variables - Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction (excluding insulated edges).

UNIT IV FOURIER TRANSFORMS 9+3
UNIT V Z-TRANSFORMS AND DIFFERENCE EQUATIONS


OUTCOMES:

- The understanding of the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.

TEXT BOOKS:


REFERENCES:


GE6351 ENVIRONMENTAL SCIENCE AND ENGINEERING

OBJECTIVES:

To study the nature and facts about environment.
- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY

Definition, scope and importance of Risk and hazards; Chemical hazards, Physical hazards, Biological hazards in the environment – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers- Oxygen cycle and Nitrogen cycle – energy flow in the ecosystem – ecological succession processes – 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 (Atmospheric chemistry- Chemical composition of the atmosphere; Chemical and photochemical reactions in the atmosphere - formation of smog, PAN, acid rain, oxygen and ozone chemistry- Mitigation procedures- Control of particulate and gaseous emission, Control of SO₂, NOₓ, CO and HC) (b) Water pollution: Physical and chemical properties of terrestrial and marine water and their environmental significance; Water quality parameters – physical, chemical and biological; absorption of heavy metals - Water treatment processes. (c) Soil pollution - soil waste management: causes, effects and control measures of municipal solid wastes – (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – role of an individual in prevention of pollution – pollution case studies –

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 overutilization of surface and ground 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. Energy Conversion processes – Biogas – production and uses, anaerobic digestion; 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. Introduction to Environmental Biochemistry: Proteins – Biochemical degradation of pollutants, Bioconversion of pollutants.

Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT


Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT


TOTAL : 45 PERIODS
OUTCOMES:
Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.

- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disasters

TEXTBOOKS:

REFERENCES:

CE6301 ENGINEERING GEOLOGY L T P C 3 0 0 3

OBJECTIVES:
- At the end of this course the students will be able to understand the importance of geological knowledge such as earth, earthquake, volcanism and to apply this knowledge in projects such as dams, tunnels, bridges, roads, airport and harbor as well as to choose types of foundations.

UNIT I PHYSICAL GEOLOGY

UNIT II MINEROLOGY

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

UNIT IV STRUCTURAL GEOLOGY AND GEOPHYSICAL METHODS

UNIT V APPLICATION OF GEOLOGICAL INVESTIGATIONS
Remote sensing for civil engineering applications; Geological conditions necessary for design and construction of Dams, Reservoirs, Tunnels, and Road cuttings - Hydrogeological
investigations and mining - Coastal protection structures. Investigation of Landslides, causes and mitigation.

TOTAL: 45 PERIODS

OUTCOMES:
The students completing this course
- Will be able to understand the importance of geological knowledge such as earth, earthquake, volcanism and the action of various geological agencies.
- Will realize the importance of this knowledge in projects such as dams, tunnels, bridges, roads, airport and harbor
- Can choose the types of foundations and other related aspects.

TEXT BOOKS:

REFERENCES:

CE6302 MECHANICS OF SOLIDS L T P C
3 1 0 4

OBJECTIVES:
- To learn fundamental concepts of Stress, Strain and deformation of solids with applications to bars, beams and thin cylinders.
- To know the mechanism of load transfer in beams, the induced stress resultants and deformations.
- To understand the effect of torsion on shafts and springs.
- To analyse a complex two dimensional state of stress and plane trusses

UNIT I STRESS AND STRAIN

UNIT II SHEAR AND BENDING IN BEAMS
Beams and Bending- Types of loads, supports – Shear Force and Bending Moment Diagrams for statically determinate beam with concentrated load, UDL, uniformly varying load. Theory of Simple Bending – Analysis of Beams for Stresses – Stress Distribution at a cross Section due to bending moment and shear force for Cantilever, simply supported and overhanging beams with different loading conditions - Flitched Beams.

UNIT III DEFLECTION
UNIT IV    TORSION

UNIT V    COMPLEX STRESSES AND PLANE TRUSSES
2 D State of Stress – 2 D Normal and Shear Stresses on any plane – Principal Stresses and Principal Planes – Mohr’s circle - Plane trusses: Analysis of plane trusses - method of joints - method of sections.

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

TEXTBOOKS:

REFERENCES :

CE6303 MECHANICS OF FLUIDS L T P C
3 0 0 3

OBJECTIVES:
- To understand the basic properties of the fluid, fluid kinematics, fluid dynamics and to analyse and appreciate the complexities involved in solving the fluid flow problems.

UNIT I FLUID PROPERTIES AND FLUID STATICS
Fluid – definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillarity and surface tension - Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers and pressure gauges- forces on planes – centre of pressure – bouncy and floatation.

UNIT II FLUID KINEMATICS AND DYNAMICS
Fluid Kinematics - Flow visualization - lines of flow - types of flow - velocity field and acceleration - continuity equation (one and three dimensional differential forms)- Equation of streamline - stream function - velocity potential function - circulation - flow net. Fluid dynamics - equations of motion -
Euler’s equation along a streamline - Bernoulli’s equation – applications - Venturi meter, Orifice meter and Pitot tube. Linear momentum equation and its application.

UNIT III  FLOW THROUGH PIPES
Viscous flow - Shear stress, pressure gradient relationship - laminar flow between parallel plates - Laminar flow through circular tubes (Hagen poiseulle’s) - Hydraulic and energy gradient - flow through pipes - Darcy -Weisbach’s equation - pipe roughness -friction factor- Moody’s diagram- Major and minor losses of flow in pipes - Pipes in series and in parallel.

UNIT IV  BOUNDARY LAYER

UNIT V  DIMENSIONAL ANALYSIS AND MODEL STUDIES
Fundamental dimensions - dimensional homogeneity - Rayleigh’s method and Buckingham Pi-Theorem - Dimensionless parameters - Similitude and model studies - Distorted Models.

TOTAL: 45 PERIODS

OUTCOMES:
• The students will be able to get a basic knowledge of fluids in static, kinematic and dynamic equilibrium.
• They will also gain the knowledge of the applicability of physical laws in addressing problems in hydraulics.

TEXT BOOKS:

REFERENCES:

CE6304 SURVEYING I  L T P C
3 0 0 3

OBJECTIVES:
• To introduce the principles of various surveying methods and applications to Civil Engineering projects

UNIT I  FUNDAMENTALS AND CHAIN SURVEYING
Definition- Classifications - Basic principles-Equipment and accessories for ranging and chaining – Methods of ranging - well conditioned triangles – Errors in linear measurement and their corrections - Obstacles - Traversing – Plotting – applications- enlarging the reducing the figures – Areas enclosed by straight line irregular figures- digital planimetre.
UNIT II  COMPASS AND PLANE TABLE SURVEYING

UNIT III  LEVELLING
Level line - Horizontal line - Datum - Bench marks -Levels and staves - temporary and permanent adjustments – Methods of levelling - Fly levelling - Check levelling - Procedure in levelling - Booking -Reduction - Curvature and refraction - Reciprocal levelling – Sources of Errors in levelling- Precise levelling - Types of instruments - Adjustments - Field procedure

UNIT IV  LEVELLING APPLICATIONS

UNIT V  THEODOLITE SURVEYING
Theodolite - Types - Description - Horizontal and vertical angles - Temporary and permanent adjustments – Heights and distances– Tangential and Stadia Tacheometry – Subtense method - Stadia constants - Anallactic lens.

TOTAL: 45 PERIODS

OUTCOMES:
- Students are expected to use all surveying equipments, prepare LS & CS, contour maps and carryout surveying works related to land and civil engineering projects.

TEXT BOOKS:

REFERENCES:

CE6311  SURVEY PRACTICAL I  L T P C 0 0 4 2

OBJECTIVES:
- At the end of the course the student will posses knowledge about Survey field techniques

LIST OF EXPERIMENTS:
1. Study of chains and its accessories
2. Aligning, Ranging and Chaining
3. Chain Traversing
4. Compass Traversing
5. Plane table surveying: Radiation
6. Plane table surveying: Intersection
7. Plane table surveying: Traversing
8. Plane table surveying: Resection – Three point problem
9. Plane table surveying: Resection – Two point problem
10. Study of levels and leveling staff
11. Fly leveling using Dumpy level
12. Fly leveling using tilting level

35
13. Check leveling
14. LS and CS
15. Contouring
16. Study of Theodolite

TOTAL: 60 PERIODS

OUTCOMES:
• Students completing this course would have acquired practical knowledge on handling basic survey instruments including leveling and development of contour map of given area.

REFERENCES:

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description of Equipment</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Total Station</td>
<td>3 Nos</td>
</tr>
<tr>
<td>2.</td>
<td>Theodolites</td>
<td>Atleast 1 for every 5 students</td>
</tr>
<tr>
<td>3.</td>
<td>Dumpy level</td>
<td>Atleast 1 for every 5 students</td>
</tr>
<tr>
<td>4.</td>
<td>Plane table</td>
<td>Atleast 1 for every 5 students</td>
</tr>
<tr>
<td>5.</td>
<td>Pocket stereoscope</td>
<td>1</td>
</tr>
<tr>
<td>6.</td>
<td>Ranging rods</td>
<td>1 for a set of 5 students</td>
</tr>
<tr>
<td>7.</td>
<td>Leveling staff</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Cross staff</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Chains</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Tapes</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Arrows</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Prismatic Compass</td>
<td>3 Nos.</td>
</tr>
<tr>
<td>13.</td>
<td>Surveyor Compass</td>
<td>1 No.</td>
</tr>
</tbody>
</table>

CE6312  COMPUTER AIDED BUILDING DRAWING  

OBJECTIVES:
• To introduce the students to draft the plan, elevation and sectional views of buildings in accordance with development and control rules satisfying orientation and functional requirements as per National Building Code.

LIST OF EXPERIMENTS:
1. Principles of planning, orientation and complete joinery details (Paneled and Glazed Doors and Windows)
2. Buildings with load bearing walls
3. Buildings with sloping roof
4. R.C.C. framed structures.
5. Industrial buildings – North light roof structures
6. Building Information Modeling

TOTAL: 60 PERIODS

OUTCOMES:
• The students will be able to draft the plan, elevation and sectional views of the buildings, industrial structures, framed buildings using computer softwares.
TEXTBOOKS:

REFERENCES:

NOTE TO QUESTION PAPER SETTER:
30% weightage for planning, while the rest 70% for drafting skill.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description of Equipment</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Computer system of Pentium IV or equivalent</td>
<td>1 for each student</td>
</tr>
<tr>
<td>2.</td>
<td>AUTOCAD</td>
<td>1 copy for a set of 3 students</td>
</tr>
</tbody>
</table>

MA6459   NUMERICAL METHODS
L T P C
3 1 0 4

OBJECTIVES:
- This course aims at providing the necessary basic concepts of a few numerical methods
  and give procedures for solving numerically different kinds of problems occurring in
  engineering and technology

UNIT I   SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 10+3
Solution of algebraic and transcendental equations - Fixed point iteration method – Newton
Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting -
Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Matrix Inversion by
Gauss Jordan method - Eigen values of a matrix by Power method.

UNIT II  INTERPOLATION AND APPROXIMATION 8+3
Interpolation with unequal intervals - Lagrange’s interpolation – Newton’s divided difference
interpolation – Cubic Splines - Interpolation with equal intervals - Newton's forward and backward
difference formulae.

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

UNIT IV  INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9+3
Single Step methods - Taylor’s series method - Euler’s method - Modified Euler’s method - Fourth
order Runge-Kutta method for solving first order equations - Multi step methods - Milne’s and
Adams-Bash forth predictor corrector methods for solving first order equations.
UNIT V  BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9+3

Finite difference methods for solving two-point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace’s and Poisson’s equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.

OUTCOMES:
- The students will have a clear perception of the power of numerical techniques, ideas and would be able to demonstrate the applications of these techniques to problems drawn from industry, management and other engineering fields.

TEXTBOOKS:

REFERENCES:

CE6401 CONSTRUCTION MATERIALS L T P C 3 0 0 3

OBJECTIVES:
- To introduce students to various materials commonly used in civil engineering construction and their properties.

UNIT I  STONES – BRICKS – CONCRETE BLOCKS 9

UNIT II  LIME – CEMENT – AGGREGATES – MORTAR 9

UNIT III  CONCRETE 9
UNIT IV TIMBER AND OTHER MATERIALS

UNIT V MODERN MATERIALS

OUTCOMES:
On completion of this course the students will be able to
- compare the properties of most common and advanced building materials.
- understand the typical and potential applications of these materials
- understand the relationship between material properties and structural form
- understand the importance of experimental verification of material properties.

TEXT BOOKS:

REFERENCES:

CE6402 STRENGTH OF MATERIALS

OBJECTIVES:
- To know the method of finding slope and deflection of beams and trusses using energy theorems and to know the concept of analysing indeterminate beam
- To estimate the load carrying capacity of columns, stresses due to unsymmetrical bending and various theories for failure of material.

UNIT I ENERGY PRINCIPLES
Strain energy and strain energy density – strain energy due to axial load, shear, flexure and torsion – Castigliano’s theorems – Maxwell’s reciprocal theorems - Principle of virtual work – application of energy theorems for computing deflections in beams and trusses - Williot Mohr’s Diagram.
UNIT II INDETERMINATE BEAMS
Concept of Analysis - Propped cantilever and fixed beams-fixed end moments and reactions – Theorem of three moments – analysis of continuous beams – shear force and bending moment diagrams.

UNIT III COLUMNS AND CYLINDER
Euler’s theory of long columns – critical loads for prismatic columns with different end conditions; Rankine-Gordon formula for eccentrically loaded columns – Eccentrically loaded short columns – middle third rule – core section – Thick cylinders – Compound cylinders.

UNIT IV STATE OF STRESS IN THREE DIMENSIONS

UNIT V ADVANCED TOPICS IN BENDING OF BEAMS
Unsymmetrical bending of beams of symmetrical and unsymmetrical sections – Shear Centre - curved beams – Winkler Bach formula.

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

OUTCOMES:
- students will have through knowledge in analysis of indeterminate beams and use of energy method for estimating the slope and deflections of beams and trusses.
- they will be in a position to assess the behaviour of columns, beams and failure of materials.

TEXT BOOKS:

REFERENCES:

CE6403 APPLIED HYDRAULIC ENGINEERING

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

UNIT I UNIFORM FLOW
Definition and differences between pipe flow and open channel flow - Types of Flow - Properties of open channel - Fundamental equations - Velocity distribution in open channel - Steady uniform flow: Chezy equation, Manning equation - Best hydraulic sections for uniform flow - Computation in Uniform Flow - Specific energy and specific force - Critical depth and velocity.

UNIT II GRADUALLY VARIED FLOW
UNIT III  RAPIDLY VARIED FLOW  9
Application of the energy equation for RVF - Critical depth and velocity - Critical, Sub-critical and Super-critical flow - Application of the momentum equation for RVF - Hydraulic jumps - Types - Energy dissipation - Surges and surge through channel transitions.

UNIT IV  TURBINES  9
Impact of Jet on vanes - Turbines - Classification - Reaction turbines - Francis turbine, Radial flow turbines, draft tube and cavitation - Propeller and Kaplan turbines - Impulse turbine - Performance of turbine - Specific speed - Runaway speed - Similarity laws.

UNIT V  PUMPS  9
Centrifugal pumps - Minimum speed to start the pump - NPSH - Cavitations in pumps - Operating characteristics - Multistage pumps - Reciprocating pumps - Negative slip - Flow separation conditions - Air vessels, indicator diagrams and its variations - Savings in work done - Rotary pumps: Gear pump.

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

OUTCOMES:
- The students will be able to apply their knowledge of fluid mechanics in addressing problems in open channels.
- They will possess the skills to solve problems in uniform, gradually and rapidly varied flows in steady state conditions.
- They will have knowledge in hydraulic machineries (pumps and turbines).

TEXTBOOKS:

REFERENCES:
4. Mays L. W., "Water Resources Engineering", John Wiley and Sons (WSE), New York, 2005
Measuring principle, working principle, Sources of Error, Microwave Total Station instruments. Comparisons between Electro-optical and Microwave system. Care and maintenance of Total Station instruments. Modern positioning systems – Traversing and Triangulation.

UNIT IV GPS SURVEYING
Basic Concepts - Different segments - space, control and user segments - satellite configuration - signal structure - Orbit determination and representation - Anti Spoofing and Selective Availability - Task of control segment – Hand Held and Geodetic receivers – data processing - Traversing and Triangulation.

UNIT V ADVANCED TOPICS IN SURVEYING

OUTCOMES: On completion of this course students shall be able to
- Understand the advantages of electronic surveying over conventional surveying methods
- Understand the working principle of GPS, its components, signal structure, and error sources
- Understand various GPS surveying methods and processing techniques used in GPS observations

TEXTBOOKS:

REFERENCES:

CE6405 SOIL MECHANICS L T P C 3 0 0 3

OBJECTIVES:
- To impart knowledge on behavior and the performance of saturated soil. At the end of this course student attains adequate knowledge in assessing both physical and engineering behaviour of soils, mechanism of stress transfer in two-phase systems and stability analysis of slopes.

UNIT I SOIL CLASSIFICATION AND COMPACITION 9

UNIT II SOIL WATER AND WATER FLOW 9
UNIT III  
STRESS DISTRIBUTION AND SETTLEMENT  9

UNIT IV  
SHEAR STRENGTH  9

UNIT V  
SLOPE STABILITY  9

OUTCOMES:
- Students have the ability to determine Index properties and classify the soil. They can also know to determine engineering properties through standard tests and empirical correction with index properties.

TEXTBOOKS:

REFERENCES:

CE6411  
STRENGTH OF MATERIALS LABORATORY  L T P C
0 0 3 2

OBJECTIVES:
- To expose the students to the testing of different materials under the action of various forces and determination of their characteristics experimentally.

LIST OF EXPERIMENTS
1. Tension test on mild steel rod
2. Compression test on wood
3. Double shear test on metal
4. Torsion test on mild steel rod
5. Impact test on metal specimen (Izod and Charpy)
6. Hardness test on metals (Rockwell and Brinell Hardness Tests)
7. Deflection test on metal beam
8. Compression test on helical spring
9. Deflection test on carriage spring
10. Test on Cement

TOTAL: 45 PERIODS

OUTCOMES:
- The students will have the required knowledge in the area of testing of materials and components of structural elements experimentally.

REFERENCES:
2. IS1786-2008, Specification for cold worked steel high strength deformed bars for concrete reinforcement, 2008

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

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<tr>
<th>Sl. No.</th>
<th>Description of Equipment</th>
<th>Quantity</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>UTM of minimum 400 kN capacity</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>Torsion testing machine for steel rods</td>
<td>1</td>
</tr>
<tr>
<td>3.</td>
<td>Izod impact testing machine</td>
<td>1</td>
</tr>
<tr>
<td>4.</td>
<td>Hardness testing machine</td>
<td>1 each</td>
</tr>
<tr>
<td></td>
<td>Rockwell</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vicker’s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Brinnel</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Beam deflection test apparatus</td>
<td>1</td>
</tr>
<tr>
<td>6.</td>
<td>Extensometer</td>
<td>1</td>
</tr>
<tr>
<td>7.</td>
<td>Compressometer</td>
<td>1</td>
</tr>
<tr>
<td>8.</td>
<td>Dial gauges</td>
<td>Few</td>
</tr>
<tr>
<td>9.</td>
<td>Le Chatelier’s apparatus</td>
<td>2</td>
</tr>
<tr>
<td>10.</td>
<td>Vicat’s apparatus</td>
<td>2</td>
</tr>
<tr>
<td>11.</td>
<td>Mortar cube moulds</td>
<td>10</td>
</tr>
</tbody>
</table>

CE6412 HYDRAULIC ENGINEERING LABORATORY L T P C 0 0 3 2

OBJECTIVES:
- Students should be able to verify the principles studied in theory by performing the experiments in lab.

LIST OF EXPERIMENTS

A. Flow Measurement
1. Calibration of Rotometer
2. Flow through Venturimeter Orificemeter
3. Flow through variable duct area - Bernoulli’s Experiment
4. Flow through Orifice, Mouthpiece and Notches

B. Losses in Pipes
5. Determination of friction coefficient in pipes
6. Determination of loss coefficients for pipe fittings

C. Pumps
7. Characteristics of Centrifugal pumps
8. Characteristics of Gear pump
9. Characteristics of Submersible pump
10. Characteristics of Reciprocating pump

17
D. Turbines
11. Characteristics of Pelton wheel turbine
12. Characteristics of Francis turbine
13. Characteristics of Kaplan turbine
E. Determination of Metacentric height
14. Determination of Metacentric height (Demonstration)

OUTCOMES:
- The students will be able to measure flow in pipes and determine frictional losses.
- The students will be able to develop characteristics of pumps and turbines.

REFERENCES:

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
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<th>Sl. No.</th>
<th>Description of Equipment</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Bernoulli’s theorem – Verification Apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>2.</td>
<td>Calculation of Metacentric height water tank Ship model with accessories</td>
<td>1 No.</td>
</tr>
<tr>
<td>4.</td>
<td>Flow measurement open channel flow (i) Channel with provision for fixing notches (rectangular, triangular &amp; trapezoidal forms)</td>
<td>1 Unit</td>
</tr>
<tr>
<td></td>
<td>(ii) Flume assembly with provisions for conducting experiments on Hydraulic jumps, generation of surges etc.</td>
<td>1 Unit</td>
</tr>
<tr>
<td>5.</td>
<td>Flow measurement in pipes (i) Venturimeter, U tube manometer fixtures like Valves, collecting tank</td>
<td>1 Unit</td>
</tr>
<tr>
<td></td>
<td>(ii) Orifice meter, with all necessary fittings in pipe lines of different diameters</td>
<td>1 Unit</td>
</tr>
<tr>
<td></td>
<td>(iii) Calibration of flow through orifice tank with Provisions for fixing orifices of different shapes, collecting tank</td>
<td>1 Unit</td>
</tr>
<tr>
<td></td>
<td>(iv) Calibration of flow through mouth piece Tank with provisions for fixing mouth pieces Viz external mouth pieces &amp; internal mouth piece Borda’s mouth piece</td>
<td>1 Unit</td>
</tr>
<tr>
<td>6.</td>
<td>Losses in Pipes Major loss – Friction loss Pipe lengths (min. 3m) of different diameters with Valves and pressure rapping &amp; collecting tank</td>
<td>1 Unit</td>
</tr>
<tr>
<td>7.</td>
<td>Minor Losses Pipe line assembly with provisions for having Sudden contractions in diameter, expansions Bends, elbow fitting, etc.</td>
<td>1 Unit</td>
</tr>
<tr>
<td>8.</td>
<td>Pumps (i) Centrifugal pump assembly with accessories (single stage)</td>
<td>1 Unit</td>
</tr>
<tr>
<td></td>
<td>(ii) Centrifugal pump assembly with accessories (multi stage)</td>
<td>1 Unit</td>
</tr>
<tr>
<td></td>
<td>(iii) Reciprocating pump assembly with accessories</td>
<td>1 Unit</td>
</tr>
<tr>
<td></td>
<td>(iv) Deep well pump assembly set with accessories</td>
<td>1 Unit</td>
</tr>
</tbody>
</table>
9. **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

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**CE6413**

**SURVEY PRACTICAL II**

**L T P C** 0 0 4 2

**OBJECTIVES:**

- At the end of the course the student will possess knowledge about Survey field techniques.

**LIST OF EXPERIMENTS:**

1. Study of theodolite
2. Measurement of horizontal angles by reiteration and repetition and vertical angles
3. Theodolite survey traverse
5. Tacheometry - Tangential system - Stadia system - Subtense system.
6. Setting out works - Foundation marking - Simple curve (right/left-handed) - Transition curve.
7. Field observation for and Calculation of azimuth
8. Field work using Total Station.

**OUTCOMES:**

- Students completing this course would have acquired practical knowledge on handling survey instruments like Theodolite, Tacheometry and Total station and have adequate knowledge to carryout Triangulation and Astronomical surveying including general field marking for various engineering projects and curves setting.

**REFERENCES:**


**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS**

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<td>Total Station</td>
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<tr>
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<td>Pocket stereoscope</td>
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<td>6</td>
<td>Ranging rods</td>
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<td>7</td>
<td>Levelling staff</td>
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<td>Chains</td>
<td></td>
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<tr>
<td>10</td>
<td>Tapes</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Arrows</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Hand held GPS</td>
<td>3 Nos</td>
</tr>
</tbody>
</table>
OBJECTIVES:
- To introduce the students to basic theory and concepts of structural analysis and the classical methods for the analysis of buildings.

UNIT I INDETERMINATE FRAMES
Degree of static and kinematic indeterminacies for plane frames - analysis of indeterminate pin-jointed frames - rigid frames (Degree of statical indeterminacy up to two) - Energy and consistent deformation methods.

UNIT II MOVING LOADS AND INFLUENCE LINES
Influence lines for reactions in statically determinate structures – influence lines for member forces in pin-jointed frames – Influence lines for shear force and bending moment in beam sections – Calculation of critical stress resultants due to concentrated and distributed moving loads.
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 carryover of moments – Stiffness and carry over factors – Analysis of continuous beams – Plane rigid frames with and without sway – Neylor’s simplification.

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

OUTCOMES:
Students will be able to
- analyse trusses, frames and arches
- analyse structures for moving loads and
- will be conversant with classical methods of analysis.

TEXTBOOKS:

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

UNIT I SITE INVESTIGATION AND SELECTION OF FOUNDATION 9

UNIT II SHALLOW FOUNDATION 9

UNIT III FOOTINGS AND RAFTS 9
Types of footings – Contact pressure distribution: Isolated footing – Combined footings – Types and proportioning – Mat foundation – Types and applications – Proportioning – Floating foundation – Seismic force consideration – Codal Provision.

UNIT IV PILE FOUNDATION 9
Types of piles and their function – Factors influencing the selection of pile – Carrying capacity of single pile in granular and cohesive soil – static formula – dynamic formulae (Engineering news and Hileys) – Capacity from insitu tests (SPT and SCPT) – Negative skin friction – uplift capacity-Group capacity by different methods (Feld’s rule, Converse – Labarra formula and block failure criterion) – Settlement of pile groups – Interpretation of pile load test (routine test only) – Under reamed piles – Capacity under compression and uplift.

UNIT V RETAINING WALLS 9

TOTAL : 45 PERIODS

OUTCOMES:
- Students will have the ability to select type of foundation required for the soil at a place and able to design shallow, foundation, deep foundation and retaining structures.

TEXTBOOKS:
REFERENCES:

CE6503 ENVIRONMENTAL ENGINEERING I  L T P C 3 0 0 3

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

UNIT I PLANNING FOR WATER SUPPLY SYSTEM 8

UNIT II CONVEYANCE SYSTEM  7
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 12
Objectives - Unit operations and processes - Principles, functions design and drawing of Chemical feeding, Flash mixers, flocculators, sedimentation tanks and sand filters - Disinfection - Residue Management - Construction and Operation & Maintenance aspects of Water Treatment Plants.

UNIT IV ADVANCED WATER TREATMENT 9
Principles and functions of Aeration - Iron and manganese removal, Defluoridation and demineralization - Water softening - Desalination - Membrane Systems - Recent advances.
UNITV WATER DISTRIBUTION AND SUPPLY TO BUILDINGS


TOTAL: 45 PERIODS

OUTCOMES:
The students completing the course will have

- an insight into the structure of drinking water supply systems, including water transport, treatment and distribution
- an understanding of water quality criteria and standards, and their relation to public health,
- the ability to design and evaluate water supply project alternatives on basis of chosen selection criteria

TEXTBOOKS:

REFERENCES:

CE6504 HIGHWAY ENGINEERING L T P C
3 0 0 3

OBJECTIVES:
- To give an overview about the highway engineering with respect to, planning, design, construction and maintenance of highways as per IRC standards, specifications and methods.

UNIT I HIGHWAY PLANNING AND ALIGNMENT 8
Significance of highway planning – Modal limitations towards sustainability - History of road development in India – Classification of highways – Locations and functions – Factors influencing highway alignment – Soil suitability analysis - Road ecology - Engineering surveys for alignment, objectives, conventional and modern methods.

UNIT II GEOMETRIC DESIGN OF HIGHWAYS 12
Typical cross sections of Urban and Rural roads — Cross sectional elements - Sight distances – Horizontal curves, Super elevation, transition curves, widening at curves – Vertical curves - Gradients, Special consideration for hill roads - Hairpin bends – Lateral and vertical clearance at underpasses.

UNIT III DESIGN OF FLEXIBLE AND RIGID PAVEMENTS 9
Design principles – pavement components and their role - Design practice for flexible and rigid Pavements (IRC methods only) - Embankments.

UNIT IV HIGHWAY CONSTRUCTION MATERIALS AND PRACTICE 8
Highway construction materials, properties, testing methods – CBR Test for subgrade - tests on aggregate & bitumen – Construction practice including modern materials and methods, Bituminous and Concrete road construction, Polymer modified bitumen, Recycling, Different materials – Glass, Fiber, Plastic, Geo-Textiles, Geo-Membrane (problem not included) - Quality control measures - Highway drainage — Construction machineries.
UNIT V EVALUATION AND MAINTENANCE OF PAVEMENTS


TOTAL: 45 PERIODS

OUTCOMES:
- The students completing this course would have acquired knowledge on planning, design, construction and maintenance of highways as per IRC standards and other methods.

TEXTBOOKS:
3. Indian Road Congress (IRC), Guidelines and Special Publications of Planning and Design.

REFERENCES:
5. Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, New Delhi, 2010

CE6505 DESIGN OF REINFORCED CONCRETE ELEMENTS L T P C 3 0 0 3

OBJECTIVES:
- To introduce the different types of philosophies related to design of basic structural elements such as slab, beam, column and footing which form part of any structural system with reference to Indian standard code of practice.

UNIT I METHODS OF DESIGN OF CONCRETE STRUCTURES 9

UNIT II LIMIT STATE DESIGN FOR FLEXURE 9
Analysis and design of singly and doubly reinforced rectangular and flanged beams - Analysis and design of one way, two way and continuous slabs subjected to uniformly distributed load for various boundary conditions.

UNIT III LIMIT STATE DESIGN FOR BOND, ANCHORAGE SHEAR & TORSION 9
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 9
Types of columns – Braced and unbraced columns – Design of short Rectangular and circular columns for axial, uniaxial and biaxial bending.

UNIT V LIMIT STATE DESIGN OF FOOTING 9
Design of wall footing – Design of axially and eccentrically loaded rectangular pad and sloped footings – Design of combined rectangular footing for two columns only.

TOTAL: 45 PERIODS

OUTCOMES:
- The student shall be in a position to design the basic elements of reinforced concrete structures.

TEXTBOOKS:

REFERENCES:
7. SP16, IS456:1978 “Design Aids for Reinforced Concrete to Bureau of Indian Standards, New Delhi, 1999

CE6506 CONSTRUCTION TECHNIQUES, EQUIPMENT AND PRACTICE L T P C 3 0 0 3

OBJECTIVES:
- 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 9
UNIT II CONSTRUCTION PRACTICES

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 waders, earth movers – Equipment for foundation and pile driving. Equipment for compaction, batching and mixing and concreting - Equipment for material handling and erection of structures - Equipment for dredging, trenching, tunneling,

TOTAL: 45 PERIODS

OUTCOMES:
- Students completing the course will have understanding of different construction techniques, practices and equipments. They will be able to plan the requirements for substructure and superstructure a construction.

TEXTBOOKS:

REFERENCES:
OBJECTIVES:

To enable learners to,

- Develop their communicative competence in English with specific reference to speaking and listening
- Enhance their ability to communicate effectively in interviews.
- Strengthen their prospects of success in competitive examinations.

UNIT I LISTENING AND SPEAKING SKILLS 12
Conversational skills (formal and informal)- group discussion- making effective presentations using computers, listening/watching interviews conversations, documentaries. Listening to lectures, discussions from TV/ Radio/ Podcast.

UNIT II READING AND WRITING SKILLS 12
Reading different genres of tests ranging from newspapers to creative writing. Writing job applications- cover letter- resume- emails- letters- memos- reports. Writing abstracts- summaries- interpreting visual texts.

UNIT III ENGLISH FOR NATIONAL AND INTERNATIONAL EXAMINATIONS AND PLACEMENTS 12
International English Language Testing System (IELTS) - Test of English as a Foreign Language (TOEFL) - Civil Service(Language related)- Verbal Ability.

UNIT IV INTERVIEW SKILLS 12
Different types of Interview format- answering questions- offering information- mock interviews-body language( paralinguistic features)- articulation of sounds- intonation.

UNIT V SOFT SKILLS 12
Motivation- emotional intelligence- Multiple intelligences- emotional intelligence- managing changes-time management-stress management-leadership straits-team work- career planning - intercultural communication- creative and critical thinking

TOTAL: 60 PERIODS

Teaching Methods:

1. To be totally learner-centric with minimum teacher intervention as the course revolves around practice.
2. Suitable audio/video samples from Podcast/YouTube to be used for illustrative purposes.
3. Portfolio approach for writing to be followed. Learners are to be encouraged to blog, tweet, text and email employing appropriate language.
4. GD/Interview/Role Play/Debate could be conducted off the laboratory (in a regular classroom) but learners are to be exposed to telephonic interview and video conferencing.
5. Learners are to be assigned to read/write/listen/view materials outside the classroom as well for graining proficiency and better participation in the class.
### Lab Infrastructure:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Description of Equipment (minimum configuration)</th>
<th>Qty Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Server</strong>&lt;br&gt;• PIV System&lt;br&gt;• 1 GB RAM / 40 GB HDD&lt;br&gt;• OS: Win 2000 server&lt;br&gt;• Audio card with headphones&lt;br&gt;• JRE 1.3</td>
<td>1 No.</td>
</tr>
<tr>
<td>2</td>
<td><strong>Client Systems</strong>&lt;br&gt;• PIII or above&lt;br&gt;• 256 or 512 MB RAM / 40 GB HDD&lt;br&gt;• OS: Win 2000&lt;br&gt;• Audio card with headphones&lt;br&gt;• JRE 1.3</td>
<td>60 Nos.</td>
</tr>
<tr>
<td>3</td>
<td>Handicam</td>
<td>1 No.</td>
</tr>
<tr>
<td>4</td>
<td>Television 46”</td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td>Collar mike</td>
<td>1 No.</td>
</tr>
<tr>
<td>6</td>
<td>Cordless mike</td>
<td>1 No.</td>
</tr>
<tr>
<td>7</td>
<td>Audio Mixer</td>
<td>1 No.</td>
</tr>
<tr>
<td>8</td>
<td>DVD recorder/player</td>
<td>1 No.</td>
</tr>
<tr>
<td>9</td>
<td><strong>LCD Projector with MP3/CD/DVD provision for Audio/video facility</strong></td>
<td>1 No.</td>
</tr>
</tbody>
</table>

**Evaluation:**

**Internal: 20 marks**

Record maintenance: Students should write a report on a regular basis on the activities conducted, focusing on the details such as the description of the activity, ideas emerged, learning outcomes and so on. At the end of the semester records can be evaluated out of 20 marks.

**External: 80 marks**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online Test</td>
<td>35</td>
</tr>
<tr>
<td>Interview</td>
<td>15</td>
</tr>
<tr>
<td>Presentation</td>
<td>15</td>
</tr>
<tr>
<td>Group Discussion</td>
<td>15</td>
</tr>
</tbody>
</table>

**Note on Internal and External Evaluation:**

1. Interview – mock interview can be conducted on one-on-one basis.
2. Speaking – example for role play:
   a. Marketing engineer convincing a customer to buy his product.
   b. Telephonic conversation- fixing an official appointment / placing an order / enquiring and so on.
3. Presentation – should be extempore on simple topics.
4. Discussion – topics of different kinds; general topics, and case studies.
OUTCOMES:

At the end of the course, learners should be able to

- Take international examination such as IELTS and TOEFL
- Make presentations and Participate in Group Discussions.
- Successfully answer questions in interviews.

REFERENCES:

2. Graded Examinations in Spoken English and Spoken English for Work downloadable materials from Trinity College, London.
4. Interactive Multimedia Programs on Managing Time and Stress.

Web Sources:

http://www.slideshare.net/rohitjsh/presentation-on-group-discussion

http://www.washington.edu/doit/TeamN/present_tips.html

http://www.oxforddictionaries.com/words/writing-job-applications

http://www.kent.ac.uk/careers/cv/coveringletters.htm

http://www.mindtools.com/pages/article/newCDV_34.htm

CE6511 SOIL MECHANICS LABORATORY

OBJECTIVES:

- At the end of the course student attains adequate knowledge in assessing both Physical and Engineering behaviour of soils through laboratory testing procedures.

LIST OF EXPERIMENTS :

1. DETERMINATION OF INDEX PROPERTIES 22
   a. Special gravity of soil solids
   b. Grain size distribution – Sieve analysis
   c. Grain size distribution Hydrometer analysis
   d. Liquid limit and Plastic limit tests
   e. Shrinkage limit and Differential free swell tests

2. DETERMINATION OF INSITU DENSITY AND COMPACTION CHARACTERISTICS 8
   a. Field density Test (Sand replacement method)
3. **DETERMINATION OF ENGINEERING PROPERTIES**

a. Permeability determination (constant head and falling head methods)
b. One dimensional consolidation test (Determination of co-efficient of consolidation only)
c. Direct shear test in cohesion-less soil
d. Unconfined compression test in cohesive soil
e. Laboratory vane Shear test in cohesive soil
f. Tri-axial compression test in cohesion-less soil (Demonstration only)
g. California Bearing Ratio Test

**TOTAL: 60 PERIODS**

**OUTCOMES:**
- Students know the techniques to determine index properties and engineering properties such as shear strength, compressibility and permeability by conducting appropriate tests.

**REFERENCES:**

### LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Description of Equipment</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Sieves</td>
<td>2 sets</td>
</tr>
<tr>
<td>2.</td>
<td>Hydrometer</td>
<td>2 sets</td>
</tr>
<tr>
<td>3.</td>
<td>Liquid and plastic limit apparatus</td>
<td>2 sets</td>
</tr>
<tr>
<td>4.</td>
<td>Shinkage limit apparatus</td>
<td>3 sets</td>
</tr>
<tr>
<td>5.</td>
<td>Proctor compaction apparatus</td>
<td>2 sets</td>
</tr>
<tr>
<td>6.</td>
<td>UTM of minimum of 20KN capacity</td>
<td>1</td>
</tr>
<tr>
<td>7.</td>
<td>Direct shear apparatus</td>
<td>1</td>
</tr>
<tr>
<td>8.</td>
<td>Thermometer</td>
<td>2</td>
</tr>
<tr>
<td>9.</td>
<td>Field density measuring device</td>
<td>2</td>
</tr>
<tr>
<td>10.</td>
<td>Triaxial shear apparatus</td>
<td>1</td>
</tr>
<tr>
<td>11.</td>
<td>Three gang consolidation test device</td>
<td>1</td>
</tr>
</tbody>
</table>

**CE6512**  
**SURVEY CAMP**  
(During IV Semester Summer Vacation) (2 Weeks)  
- - - 1

Two weeks Survey Camp will be conducted during summer vacation in the following activities:

1. Triangulation
2. Trilateration and
3. Rectangulation

**CE6601**  
**DESIGN OF REINFORCED CONCRETE & BRICK MASONRY STRUCTURES**  
LT P C  
3 0 0 3

**OBJECTIVES:**
- To give an exposure to the design of continuous beams, slabs, staircases, walls and brick masonry structures and to introduce yield line theory.
UNIT I  RETAINING WALLS  
Design of Cantilever and Counterfort Retaining walls  

UNIT II  WATER TANKS  
Design of rectangular and circular water tanks both below and above ground level - Design of circular slab.  

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

UNIT IV  YIELD LINE THEORY  
Assumptions - Characteristics of yield line - Determination of collapse load / plastic moment - Application of virtual work method - square, rectangular, circular and triangular slabs - Design problems  

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  

TOTAL: 45 PERIODS  

OUTCOMES:  
• The student shall have a comprehensive design knowledge related to various structural systems.  

TEXTBOOKS:  

REFERENCES:  

CE6602  STRUCTURAL ANALYSIS II  

OBJECTIVES:  
• To introduce the students to advanced methods of analysis like matrix methods, Plastic analysis and FE method and also analysis of space structures.
### 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 limited to two)

### UNIT III  FINITE ELEMENT METHOD

### UNIT IV  PLASTIC ANALYSIS OF STRUCTURES

### 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

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

**OUTCOMES:**
- The student will have the knowledge on advanced methods of analysis of structures including space and cable structures.

**TEXTBOOKS:**

**REFERENCES:**
OBJECTIVES:
- To introduce the students to limit state design of structural steel members subjected to compressive, tensile and bending loads, including connections. Design of structural systems such as roof trusses, gantry girders as per provisions of current code (IS 800 - 2007) of practice.

UNIT I INTRODUCTION

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

UNIT IV BEAMS
Design of laterally supported and unsupported beams – Built up beams – Beams subjected to uniaxial and biaxial bending – Design of plate girders - Intermediate and bearing stiffeners – Flange and web splices.

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

OUTCOMES:
- The students would have knowledge on the design of structural steel members subjected to compressive, tensile and bending forces, as per current code and also know to design structural systems such as roof trusses and gantry girders.

TEXTBOOKS:

REFERENCES:
5. IS800 :2007, General Construction In Steel - Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007
OBJECTIVES:
- To expose the students to Railway planning, design, construction and maintenance and planning and design principles of Airports and Harbours.

UNIT I  RAILWAY PLANNING  10
Significance of Road, Rail, Air and Water transports - Coordination of all modes to achieve sustainability - Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, - Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods- - Soil suitability analysis - Geometric design of railways, gradient, super elevation, widening of gauge on curves- Points and Crossings.

UNIT II  RAILWAY CONSTRUCTION AND MAINTENANCE  9

UNIT III  AIRPORT PLANNING  8
Air transport characteristics-airport classification-air port planning: objectives, components, layout characteristics, socio-economic characteristics of the Catchment area, criteria for airport site selection and ICAO stipulations, Typical airport layouts, Case studies, Parking and circulation area.

UNIT IV  AIRPORT DESIGN  8

UNIT V  HARBOUR ENGINEERING  10

OUTCOMES:
- On completing the course, the students will have the ability to Plan and Design various civil Engineering aspects of Railways, Airports and Harbour.

TEXTBOOKS:

REFERENCES:

CE6605 ENVIROMENTAL ENGINEERING II L T P C 3 0 0 3

OBJECTIVES:

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

UNIT I PLANNING FOR SEWERAGE SYSTEMS 7

UNIT II SEWER DESIGN 8

UNIT III PRIMARY TREATMENT OF SEWAGE 9
Objective – Selection of treatment processes – Principles, Functions, Design and Drawing of Units - Onsite sanitation - Septic tank with dispersion - Grey water harvesting – Primary treatment – Principles, functions design and drawing of screen, grit chambers and primary sedimentation tanks – Construction, operation and Maintenance aspects.

UNIT IV SECONDARY TREATMENT OF SEWAGE 12

UNIT V DISPOSAL OF SEWAGE AND SLUDGE MANAGEMENT 9

TOTAL: 45 PERIODS

OUTCOMES:
The students completing the course will have
- ability to estimate sewage generation and design sewer system including sewage pumping stations
- required understanding on the characteristics and composition of sewage, self purification of streams
- ability to perform basic design of the unit operations and processes that are used in sewage treatment

TEXTBOOKS:
REFERENCES:

CE6611 ENVIRONMENTAL ENGINEERING LABORATORY L T P C 0 0 3 2

OBJECTIVES:
- To understand the sampling and preservation methods and significance of characterization of wastewater.

LIST OF EXPERIMENTS:
2. Coagulation and Precipitation process for treating waste water
3. Determination of suspended, volatile, fixed and settleable solids in wastewater.
4. B.O.D. test
5. C.O.D. test
7. Phosphate in wastewater.
8. Determination of Calcium, Potassium and Sodium.
9. Heavy metals determination - Chromium, Lead and Zinc.
   (Demonstration only)

OUTCOMES:
- The students completing the course will be able to characterize wastewater and conduct treatability studies.

REFERENCE:

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description of Equipment</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Oxygen analyzer</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Spectrophotometer</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Ion – selective electrode</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Sodium Potassium Analyzer – Flame Photometer</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Gas Chromatography</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Atomic absorption spectroscopy (Ni, Zn, Pb)</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Nephlo - turbidity meter</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>BOD Analyser</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>COD Analyser</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Jar Test Apparatus</td>
<td>1</td>
</tr>
</tbody>
</table>
OBJECTIVES:
- To learn the principles and procedures of testing Concrete and Highway materials and to get hands on experience by conducting the tests and evolving inferences.

LIST OF EXPERIMENTS

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 AGGREGATES
   1. Specific Gravity
   2. Gradation of Aggregate
   3. Crushing Strength
   4. Abrasion Value
   5. Impact Value
   6. Water Absorption
   7. Flakiness and Elongation Indices

IV. TESTS ON BITUMEN
   1. Penetration
   2. Softening Point
   3. Ductility
   4. Flash and fire points.
   5. Viscosity

V. TESTS ON BITUMINOUS MIXES
   1. Determination of Binder Content
   3. Density

OUTCOMES:
- Student knows the techniques to characterize various pavement materials through relevant tests.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Description of Equipment</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Concrete cube moulds</td>
<td>6</td>
</tr>
<tr>
<td>2.</td>
<td>Concrete cylinder moulds</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>Concrete Prism moulds</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>Sieves</td>
<td>1 set</td>
</tr>
<tr>
<td>5.</td>
<td>Concrete Mixer</td>
<td>1</td>
</tr>
<tr>
<td>6.</td>
<td>Slump cone</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td>Flow table</td>
<td>1</td>
</tr>
<tr>
<td>8.</td>
<td>Vibrator</td>
<td>1</td>
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<tr>
<td>9.</td>
<td>Trovels and planers</td>
<td>1 set</td>
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<tr>
<td>10.</td>
<td>UTM – 400 kN capacity</td>
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<tr>
<td>11.</td>
<td>Vee Bee Consistometer</td>
<td>1</td>
</tr>
<tr>
<td>12.</td>
<td>Aggregate impact testing machine</td>
<td>1</td>
</tr>
<tr>
<td>13.</td>
<td>CBR Apparatus</td>
<td>1</td>
</tr>
</tbody>
</table>
CE6701 STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING  L T P C  3 0 0 3

OBJECTIVES:

- The main objective of the course is to introduce dynamic loading and the dynamic performance of the structures to the students. Different types of dynamic loading also to be discussed. The detailed study on the performance of structures under earthquake loading is also one of the focus of the course.

UNIT I THEORY OF VIBRATIONS 9
Difference between static loading and dynamic loading – Degree of freedom – idealisation of structure as single degree of freedom system – Formulation of Equations of motion of SDOF system - D'Alemberts principles – effect of damping – free and forced vibration of damped and undamped structures – Response to harmonic and periodic forces.

UNIT II MULTIPLE DEGREE OF FREEDOM SYSTEM 9
Two degree of freedom system – modes of vibrations – formulation of equations of motion of multi degree of freedom (MDOF) system - Eigen values and Eigen vectors – Response to free and forced vibrations - damped and undamped MDOF system – Modal superposition methods.

UNIT III ELEMENTS OF SEISMOLOGY 9

UNIT IV RESPONSE OF STRUCTURES TO EARTHQUAKE 9

UNIT V DESIGN METHODOLOGY 9

TOTAL: 45 PERIODS

OUTCOMES:

- At the end of the course, student will have the knowledge to analyse structures subjected to dynamic loading and to design the structures for seismic loading as per code provisions.

TEXTBOOKS:

REFERENCES:
OBJECTIVES:
- To introduce the need for prestressing as well as the methods, types and advantages of prestressing to the students. Students will be introduced to the design of prestressed concrete structures subjected to flexure and shear.

UNIT I INTRODUCTION – THEORY AND BEHAVIOUR

UNIT II DESIGN FOR FLEXURE AND SHEAR
Basic assumptions for calculating flexural stresses – Permissible stresses in steel and concrete as per I.S.1343 Code – Design of sections of Type I and Type II post-tensioned and pre-tensioned beams – Check for strength limit based on I.S. 1343 Code – Layout of cables in post-tensioned beams – Location of wires in pre-tensioned beams – Design for shear based on I.S. 1343 Code.

UNIT III DEFLECTION AND DESIGN OF ANCHORAGE ZONE
Factors influencing deflections – Short term deflections of uncracked members – Prediction of long term deflections due to creep and shrinkage – Check for serviceability limit state of deflection. Determination of anchorage zone stresses in post-tensioned beams by Magnel’s method, Guyon’s method and IS1343 code – design of anchorage zone reinforcement – Check for transfer bond length in pre-tensioned beams.

UNIT IV COMPOSITE BEAMS AND CONTINUOUS BEAMS
Analysis and design of composite beams – Methods of achieving continuity in continuous beams – Analysis for secondary moments – Concordant cable and linear transformation – Calculation of stresses – Principles of design.

UNIT V MISCELLANEOUS STRUCTURES
Design of tension and compression members – Tanks, pipes and poles – Partial prestressing – Definition, methods of achieving partial prestressing, merits and demerits of partial prestressing.

TOTAL: 45 PERIODS

OUTCOMES:
- Student shall have a knowledge on methods of prestressing and able to design various prestressed concrete structural elements.

TEXTBOOKS:

REFERENCES:
OBJECTIVES:

- The student is exposed to different phases in Water Resources Management and National Water Policy. Further they will be imparted required knowledge on Reservoir planning, management and economic analysis including Irrigation and Irrigation management practices.

UNIT I  WATER RESOURCES


UNIT II  WATER RESOURCE MANAGEMENT

Economics of water resources planning; – National Water Policy – Consumptive and non-consumptive water use - Water quality – Scope and aims of master plan - Concept of basin as a unit for development - Water budget- Conjunctive use of surface and ground water

UNIT III  IRRIGATION ENGINEERING


UNIT IV  CANAL IRRIGATION

Types of Impounding structures: Gravity dam – Diversion Head works - Canal drop – Cross drainage works – Canal regulations – Canal outlets – Canal lining - Kennady’s and Lacey’s Regime theory

UNIT V  IRRIGATION METHODS AND MANAGEMENT

Lift irrigation – Tank irrigation – Well irrigation – Irrigation methods: Surface and Sub-Surface and Micro Irrigation - Merits and demerits – Irrigation scheduling – Water distribution – Participatory irrigation management with a case study

OUT COMES:

- The students will have knowledge and skills on Planning, design, operation and management of reservoir system.
- The student will gain knowledge on different methods of irrigation including canal irrigation.

TEXTBOOKS:


REFERENCES:

OBJECTIVES:

- To provide the student with the ability to estimate the quantities of item of works involved in buildings, water supply and sanitary works, road works and irrigation works, and also to equip the student with the ability to do rate analysis, valuation of properties and preparation of reports for estimation of various items.

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

UNIT II  ESTIMATE OF OTHER STRUCTURES  10

UNIT III  SPECIFICATION AND TENDERS  8

UNIT IV  VALUATION  8

UNIT V  REPORT PREPARATION  8

TOTAL : 45 PERIODS

OUTCOMES:

- The student shall be able to estimate the material quantities, prepare a bill of quantities, make specifications and prepare tender documents. Student shall be able to prepare value estimates.

TEXTBOOKS:


REFERENCES:

1. PWD Data Book.
2. Tamilnadu Transparencies in Tender Act, 1998
3. Arbitration and Conciliation Act, 1996
OBJECTIVES:

- To acquire hands on experience in design and preparation of structural drawings for concrete / steel structures normally encountered in Civil Engineering practice.

LIST OF EXPERIMENTS:

1. Design and drawing of RCC cantilever and counter fort 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 circular and rectangular RCC water tanks
4. Design of plate Girder Bridge - Truss Girder bridges – Detailed Drawings including connections
5. Design of hemispherical bottomed steel tank

TOTAL: 60 PERIODS

OUTCOMES:

- 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.

TEXTBOOKS:


REFERENCES:


EXAMINATION DURATION: 3 HOURS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description of Equipment</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Models of Structures</td>
<td>1 each</td>
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<tr>
<td>2.</td>
<td>Computers Pentium IV</td>
<td>30 Nos</td>
</tr>
<tr>
<td>3.</td>
<td>Analysis and Design Software - Minimum 5 use License</td>
<td>1 No</td>
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</tbody>
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CE6712 DESIGN PROJECT

OBJECTIVES:

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

TOTAL: 60 PERIODS
EVALUATION PROCEDURE
The method of evaluation will be as follows:

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

Total: 100 marks

OUTCOMES:
- On completion of the design project students will have a better experience in designing various design problems related to Civil Engineering.

MG6851 PRINCIPLES OF MANAGEMENT LT P C
3 0 0 3

OBJECTIVES:
- To enable the students to study the evolution of Management, to study the functions and principles of management and to learn the application of the principles in an organization.

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS

UNIT II PLANNING

UNIT III ORGANISING

UNIT IV DIRECTING
UNIT V CONTROLLING
System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

TEXTBOOKS:

REFERENCES:

CE6811 PROJECT WORK

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

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

TOTAL: 180 PERIODS

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

CE6001 HYDROLOGY
OBJECTIVES:

- To impart knowledge on hydrological cycle, spatial and temporal measurement and analysis of rainfall and their applications including flood routing and ground water hydrology.

UNIT I PRECIPITATION


UNIT II ABSTRACTION FROM PRECIPITATION


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


OUTCOMES:

- The students gain the knowledge needed on hydrologic cycle, hydrometeorology and formation of precipitation.
- The students are able to apply the various methods of field measurements and empirical formulae for estimating the various losses of precipitation, stream flow, flood and flood routing.
- The students will know the basics of groundwater and hydraulics of subsurface flows.

TEXTBOOKS:


REFERENCES:


CE6002 CONCRETE TECHNOLOGY

OBJECTIVES:

- To impart knowledge to the students on the properties of materials for concrete by suitable tests, mix design for concrete and special concretes.
Cement - Different types - Chemical composition and Properties - Tests on cement - IS Specifications - Aggregates - Classification - Mechanical properties and tests as per BIS Grading requirements - Water - Quality of water for use in concrete.

UNIT II CHEMICAL AND MINERAL ADMIXTURES 9
Accelerators - Retarders - Plasticisers - Super plasticizers - Water proofers - Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaolinite - Their effects on concrete properties

UNIT III PROPORTIONING OF CONCRETE MIX 9
Principles of Mix Proportioning - Properties of concrete related to Mix Design - Physical properties of materials required for Mix Design - Design Mix and Nominal Mix - BIS Method of Mix Design - Mix Design Examples

UNIT IV FRESH AND HARDENED PROPERTIES OF CONCRETE 9
Workability - Tests for workability of concrete - Slump Test and Compacting factor Test - Segregation and Bleeding - Determination of Compressive and Flexural strength as per BIS - Properties of Hardened concrete - Determination of Compressive and Flexural strength - Stress-strain curve for concrete - Determination of Young’s Modulus.

UNIT V SPECIAL CONCRETES 9
Light weight concretes - High strength concrete - Fibre reinforced concrete - Ferrocement - Ready mix concrete - SIFCON - Shotcrete - Polymer concrete - High performance concrete - Geopolymer Concrete

OUTCOMES:
- The student will possess the knowledge on properties of materials required for concrete tests on those materials and design procedures for making conventional and special concretes.

TEXTBOOKS:

REFERENCES:
4. IS10262-1982 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi, 1998

CE6003 REMOTE SENSING TECHNIQUES AND GIS L T P C 3 0 0 3

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

UNIT I EMR AND ITS INTERACTION WITH ATMOSPHERE & EARTH MATERIAL 9
Definition of remote sensing and its components - Electromagnetic spectrum - Wavelength regions important to remote sensing - Wave theory, Particle theory, Stefan-Boltzman and Wein’s
Displacement Law – Atmospheric scattering, absorption – Atmospheric windows – spectral signature concepts – typical spectral reflective characteristics of water, vegetation and soil.

UNIT II PLATFORMS AND SENSORS
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

UNIT IV GEOGRAPHIC INFORMATION SYSTEM

UNIT V DATA ENTRY, STORAGE AND ANALYSIS

TOTAL: 45 PERIODS

OUTCOMES:
On completion of the course the students will have knowledge on
- Principles of Remote Sensing and GIS
- Analysis of RS and GIS data and interpreting the data for modeling applications

TEXTBOOKS:

REFERENCES:
3. Ian Heywood "An Introduction to GIS", Pearson Education Asia, 2000

CE6004 ARCHITECTURE

OBJECTIVES:
- To provide the basic knowledge on the principles and functional 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 12
Residential, institutional, commercial and Industrial – Application of anthropometry and space
standards-Inter relationships of functions – Safety standards – Building rules and regulations –
Integration of building services – Interior design

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

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

OUTCOMES:
• Students will have the ability to plan any civil engineering project by incorporating various
aspect of environment and climate of the project area. Further they know various rules and
regulation of town planning and development authorities.

REFERENCES:

GE6075 PROFESSIONAL ETHICS IN ENGINEERING L T P C
3 0 0 3

OBJECTIVES:
• To enable the students to create an awareness on Engineering Ethics and Human Values,
to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

UNIT I HUMAN VALUES 10
Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for
others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation –
Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and
meditation for professional excellence and stress management.

UNIT II ENGINEERING ETHICS 9
Senses of ‘Engineering Ethics’ – Variety of moral issues – Types of inquiry – Moral dilemmas –
Moral Autonomy – Kohiberg’s theory – Gilligan’s theory – Consensus and Controversy – Models of
professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of
Ethical Theories

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9
Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

TEXTBOOKS:

REFERENCES:

Web sources:
1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

CE6005 CONSTRUCTION PLANNING AND SCHEDULING L T P C 3 0 0 3

OBJECTIVES:
• To make the students to learn about planning of construction projects, scheduling procedures and techniques, cost and quality control projects and use of project information as decision making tool.

UNIT I CONSTRUCTION PLANNING 6
UNIT II SCHEDULING PROCEDURES AND TECHNIQUES 12
Relevance of construction schedules-Bar charts - The critical path method-Calculations for critical path scheduling-Activity float and schedules-Presenting project schedules-Critical path scheduling for Activity-on-node and with leads, Lags and Windows-Calculations for scheduling with leads, lags and windows-Resource oriented scheduling-Scheduling with resource constraints and precedences -Use of Advanced Scheduling Techniques-Scheduling with uncertain durations-Crashing and time/cost trade offs -Improving the Scheduling process – Introduction to application software.

UNIT III COST CONTROL MONITORING AND ACCOUNTING 9
The cost control problem-The project Budget-Forecasting for Activity cost control - financial accounting systems and cost accounts-Control of project cash flows-Schedule control-Schedule and Budget updates-Relating cost and schedule information.

UNIT IV QUALITY CONTROL AND SAFETY DURING CONSTRUCTION 9

UNIT V ORGANIZATION AND USE OF PROJECT INFORMATION 9
Types of project information-Accuracy and Use of Information-Computerized organization and use of Information -Organizing information in databases-relational model of Data bases-Other conceptual Models of Databases-Centralized database Management systems-Databases and application programs-Information transfer and Flow.

TOTAL: 45 PERIODS

OUTCOMES:
- The student should be able 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 to use the project information as decision making tool.

TEXTBOOKS:

REFERENCES:

CE6006 TRAFFIC ENGINEERING AND MANAGEMENT L T P C 3 0 0 3

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

UNIT I TRAFFIC PLANNING AND CHARACTERISTICS 9
UNIT II TRAFFIC SURVEYS

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

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

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

TOTAL: 45 PERIODS

OUTCOMES:
On completing this course, the Students will be able to
- Analyse traffic problems and plan for traffic systems various uses
- Design Channels, Intersections, signals and parking arrangements
- Develop Traffic management Systems

TEXTBOOKS:
2. Indian Roads Congress (IRC) Specifications: Guidelines and Special Publications on Traffic Planning and Management.

REFERENCES:
2. Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, New Delhi, 2010
OBJECTIVES:
- 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 is given on the principles of sustainable housing policies and programmes.

UNIT I INTRODUCTION TO HOUSING
Definition of Basic Terms – House, Home, Household, Apartments, Multi storied Buildings, Special Buildings, Objectives and Strategies of National Housing Policies including Slum Housing Policy, Principle of Sustainable Housing – Integrated approach on arriving holding capacity and density norms - All basic infrastructure consideration - 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- Plotted land development programs, Open Development Plots, Apartments, Gated communities, Townships, Rental Housing, Co-operative Housing, Slum Housing Programmes – Slum improvement – Slum redevelopment and Relocation – Use of GIS and MIS in Slum Housing Projects,, Role of Public housing agencies, and Private sector in supply, quality, infrastructure and pricing – Role of Non-Government Organizations in slum housing.

UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS
Formulation of Housing Projects – Land Use and Soil suitability analysis -Building Byelaws and Rules and Development Control Regulations - Site Analysis, Layout Design, Design of Housing Units (Design Problems) – Housing Project Formulation.

UNIT IV CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS

UNIT V HOUSING FINANCE AND PROJECT APPRAISAL

TOTAL: 45 PERIODS

OUTCOMES:
- The students should have a comprehensive knowledge of planning, design, evaluation, construction and financing of housing projects.

TEXTBOOKS:

REFERENCES:
5. UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS Habitat, Nairobi, 1994
6. Government of India, National Housing Policy, 1994
OBJECTIVES:

• To introduce the student to the principles of Groundwater governing Equations and Characteristics of different aquifers,
• To understand the techniques of development and management of groundwater.

UNIT I  HYDROGEOLOGICAL PARAMETERS


UNIT II  WELL HYDRAULICS


UNIT III  GROUNDWATER MANAGEMENT


UNIT IV  GROUNDWATER QUALITY

Ground water chemistry - Origin, movement and quality - Water quality standards – Health and aesthetic aspects of water quality - Saline intrusion – Environmental concern and Regulatory requirements

UNIT V  GROUNDWATER CONSERVATION

Artificial recharge techniques – Remediation of Saline intrusion– Ground water management studies – Protection zone delineation, Contamination source inventory, remediation schemes - Ground water Pollution and legislation.

TOTAL: 45 PERIODS

OUTCOMES:

• Students will be able to understand aquifer properties and its dynamics after the completion of the course. It gives an exposure towards well design and practical problems of groundwater aquifers.
• Students will be able to understand the importance of artificial recharge and groundwater quality concepts.

TEXTBOOKS:


REFERENCES:

OBJECTIVES:
- To introduce the student to the concept of Mathematical approaches for managing the water resources system.
- To make the students apply an appropriate system approach to optimally operate a water resource system.

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

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

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

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

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

OUTCOMES:
- The students will be exposed to the economical aspects and analysis of water resources systems by which they will get an idea of comprehensive and integrated planning of a water resources project.
- The students will develop skills in solving problems in operations research through LP, DP and Simulation techniques.

TEXTBOOK:

REFERENCES:
OBJECTIVES:

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

UNIT I  TYPE OF PAVEMENT AND STRESS DISTRIBUTION ON LAYERED SYSTEM  8
Introduction – Pavement as layered structure – Pavement types rigid and flexible. Resilient modulus - Stress and deflections in pavements under repeated loading.

UNIT II  DESIGN OF FLEXIBLE PAVEMENTS  10
Flexible pavement design factors influencing design of flexible pavement, Empirical - Semi empirical and theoretical methods – Design procedure as per IRC guidelines – Design and specification of rural roads.

UNIT III  DESIGN OF RIGID PAVEMENTS  9
Cement concrete pavements factors influencing CC pavements – Modified Westergaard approach – Design procedure as per IRC guidelines – Concrete roads and their scope in India.

UNIT IV  PERFORMANCE EVALUATION AND MAINTENANCE  10

UNIT V  STABILIZATION OF PAVEMENTS  8

TOTAL : 45 PERIODS

OUTCOMES:

- Students will have adequate knowledge to design flexible and rigid pavements based on IRC guidelines. Further they know various techniques to evaluate performance of pavements.

TEXTBOOKS:


REFERENCES:


OBJECTIVES:
To impart knowledge on Environmental management and Environmental Impact Assessment.

UNIT I INTRODUCTION
Impact of development projects – Sustainable development- Need for Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) – EIA capability and limitations – Legal provisions on EIA-Stages of EIA, Types of 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, air, social & cultural activities and on flora & fauna- Mathematical models- Public participation

UNIT IV ENVIRONMENTAL MANAGEMENT PLAN
Plan for mitigation of adverse impact on environment – Options for mitigation of impact on water, air, land and on flora & fauna - Addressing the issues related to the Project Affected People. Post project monitoring

UNIT V CASE STUDIES

TOTAL : 45 PERIODS

OUTCOMES:
The students completing the course will have ability to

- carry out scoping and screening of developmental projects for environmental and social assessments
- explain different methodologies for environmental impact prediction and assessment
- plan environmental impact assessments and environmental management plans
- evaluate environmental impact assessment reports

TEXTBOOKS:

REFERENCES:
treatment plants and human health – Environmental legislations related to prevention and control of industrial effluents and hazardous wastes

UNIT II CLEANER PRODUCTION 8

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

UNIT IV TREATMENT TECHNOLOGIES 11

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

TOTAL: 45 PERIODS

OUTCOMES:
The students completing the course will have
- an insight into the pollution from major industries including the sources and characteristics of pollutants
- ability to plan minimization of industrial wastes
- ability to design facilities for the processing and reclamation of industrial waste water

TEXTBOOKS:

REFERENCES:

CE6011 AIR POLLUTION MANAGEMENT L T P C 3 0 0 3

OBJECTIVES:
- 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 II  DISPERSION OF POLLUTANTS  9

UNIT III  AIR POLLUTION CONTROL  12
Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation – Selection criteria for equipment - gaseous pollutant control by adsorption, absorption, condensation, combustion – Pollution control for specific major industries.

UNIT IV  AIR QUALITY MANAGEMENT  8

UNIT V  NOISE POLLUTION  7
Sources of noise pollution – Effects – Assessment - Standards – Control methods – Prevention

TOTAL: 45 PERIODS

OUTCOMES:
The students completing the course will have
- an understanding of the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
- ability to identify, formulate and solve air and noise pollution problems
- ability to design stacks and particulate air pollution control devices to meet applicable standards.

TEXTBOOKS:

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

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

UNIT II ON-SITE STORAGE AND PROCESSING 8

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

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

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

TOTAL: 45 PERIODS

OUTCOMES:
The students completing the course will have
- an understanding of the nature and characteristics of municipal solid wastes and the regulatory requirements regarding municipal solid waste management
- ability to plan waste minimisation and design storage, collection, transport, processing and disposal of municipal solid waste

TEXTBOOKS:

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

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

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

UNIT III INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS 10

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

UNIT V GROUT TECHNIQUES 8

OUTCOMES:
- Student will be in a position to identify and evaluate the deficiencies if any in the deposits of a project area and capable of providing alternate methods to improve its character suitable to the project so that the structures built will be stable and serve.

TEXTBOOKS:

REFERENCES:
OBJECTIVES:

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction.
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR).
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity.

UNIT I \ INTRODUCTION TO DISASTERS

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II \ APPROACHES TO DISASTER RISK REDUCTION (DRR)

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III \ INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV \ DISASTER RISK MANAGEMENT IN INDIA

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V \ DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

OUTCOMES:
The students will be able to

- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
• Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.

TEXTBOOKS:

REFERENCES
1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005

CE6013 BRIDGE STRUCTURES

OBJECTIVES:
• To make the student to know about various bridge structures, selection of appropriate bridge structures and design it for given site conditions.

UNIT I INTRODUCTION
History of Bridges - Components of a Bridge and its definitions- Classification of Road Bridges - Selection of Site and Initial Decision Process - Survey and Alignment; Geotechnical Investigations and Interpretations. River Bridge: Selection of Bridge site and planning - Collection of Bridge design data - Hydrological calculation
Road Bridges - IRC codes - Standard Loading for Bridge Design - Influence lines for statically determinate structures - I.L. for statically indeterminate structures - Transverse distribution of Live loads among deck longitudinal - Load combinations for different working state and limit state designs
Railway Bridges: Loadings for Railway Bridges; Railroad data. Pre-design considerations; - Railroad vs. Highway bridges.

UNIT II SUPERSTRUCTURES
Selection of main bridge parameters, design methodologies -Choices of superstructure types; Orthotropic plate theory, load + techniques - Grillage analysis - Finite element analysis - Different types of superstructure (RCC and PSC); Longitudinal Analysis of Bridge.- Transverse Analysis of Bridge- Temperature Analysis-Distortional Analysis-Effects of Differential settlement of supports-Reinforced earth structures

UNIT III DESIGN OF STEEL BRIDGES
Design of Truss Bridges – Design of Plate girder bridges.

UNIT IV DESIGN OF RC AND PSC BRIDGES
Design of slab bridges – Girder bridges – PSC bridges

UNIT V SUBSTRUCTURE, BEARINGS AND DECK JOINTS, PARAPETS AND RAILINGS
Substructure - Pier; Abutment - Wing walls- Importance of Soil-Structure Interaction - Types of foundations - Open foundation- Pile foundation- Well foundation- Simply supported bridge-Continuous Bridge - Bearings and Deck Joints - Different types of bridge bearings and expansion joints - Parapets and Railings for Highway Bridges

TOTAL: 45 PERIODS
OUTCOMES:

- To develop an understanding of an appreciation for basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location and functionality.
- To help the student develop an intuitive feeling about the sizing of bridge elements, i.e., develop a clear understanding of conceptual design.
- To understand the load flow mechanism and identify loads on bridges.
- To carry out a design of bridge starting from conceptual design, selecting suitable bridge, geometry to sizing of its elements.

TEXTBOOKS:


REFERENCES:


CE6014 STORAGE STRUCTURES

OBJECTIVES:

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

UNIT I STEEL WATER TANKS


UNIT II CONCRETE WATER TANKS


UNIT III STEEL BUNKERS AND SILOS


UNIT IV CONCRETE BUNKERS AND SILOS


UNIT V PRESTRESSED CONCRETE WATER TANKS

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

- At the end of the course the student shall be able to design concrete and steel material storage structures.

TEXTBOOKS:


REFERENCES:


CE6015 TALL BUILDINGS L T P C
3 0 0 3

OBJECTIVES:

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

UNIT I DESIGN CRITERIA AND MATERIALS
Development of High Rise Structures - General Planning Considerations - Design philosophies - Materials used for Construction - High Strength Concrete - High Performance Concrete - Self Compacting Concrete - Glass - High Strength Steel

UNIT II LOADING

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

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

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

OUTCOMES:

- At the end of this course the student should have an understanding on the behaviour of tall buildings subjected to lateral building. The students should have knowledge about the rudimentary principles of designing tall buildings as per the existing codes.

TEXTBOOKS:

REFERENCES:

CE6016          PREFABRICATED STRUCTURES         L      T      P      C
                            3 0 0 3

OBJECTIVES:
• To impart knowledge to students on modular construction, industrialised construction and design of prefabricated elements and construction methods.

UNIT I          INTRODUCTION

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.

TOTAL: 45 PERIODS

OUTCOMES:
• The student shall be able to design some of the prefabricated elements and also have the knowledge of the construction methods in using these elements.

TEXTBOOKS:
1. CBRI, Building materials and components, India, 1990

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

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

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

UNIT III PHOTOELASTICITY

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

UNIT V BRITTLE COATINGS

TOTAL: 45 PERIODS

OUTCOMES:
- Students will be able to select the appropriate strain gauges for strain measurements and they have sufficient knowledge in model analysis and predict the behaviour of prototypes.

TEXTBOOKS:

REFERENCES:

OBJECTIVES:
- To facilitate the understanding of Quality Management principles and process.

UNIT II TQM PRINCIPLES 9
Leadership - Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS AND TECHNIQUES I 9
The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Benchmarking - Reason to benchmark, Benchmarking process - FMEA - Stages, Types.

UNIT IV TQM TOOLS AND TECHNIQUES II 9

UNIT V QUALITY SYSTEMS 9

TOTAL: 45 PERIODS

OUTCOMES:
- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXTBOOK:

REFERENCES:

GE 6084 HUMAN RIGHTS L T P C
3 0 0 3

OBJECTIVES:
- To sensitize the Engineering students to various aspects of Human Rights.


UNIT III
Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV
Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V

TOTAL : 45 PERIODS

OUTCOME:
- Engineering students will acquire the basic knowledge of human rights.

REFERENCES:

CE6018 COMPUTER AIDED DESIGN OF STRUCTURES LT P C 3 0 0 3

OBJECTIVES:
- To introduce the students about computer graphics, structural analysis, design and optimization and expert systems, applications in analysis.

UNIT I INTRODUCTION 9
Fundamental reason for implementing CAD - Software requirements – Hardware components in CAD system – Design process - Applications and benefits.

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

UNIT III STRUCTURAL ANALYSIS 9

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

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

TOTAL: 45 PERIODS

OUTCOMES:
- Students will be able to implement ideas of computer aided design with advantages and demerits.

TEXTBOOKS:

REFERENCES:

CE6019 INDUSTRIAL STRUCTURES L T P C
3 0 0 3

OBJECTIVES:
- This course deals with some of the special aspects with respect to Civil Engineering structures in industries.

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

UNIT II FUNCTIONAL REQUIREMENTS 9

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

UNIT IV DESIGN OF R.C. STRUCTURES 9
Corbels, Brackets and Nibs - Silos and bunkers -Chimney - Principles of folded plates and shell roofs

UNIT V PREFABRICATION 9
Principles of prefabrication – Prestressed precast roof trusses - Construction of roof and floor slabs - Wall panels.

TOTAL: 45 PERIODS

OUTCOMES:
- At the end of this course the student shall be able to design some of the structures used in industries.

TEXTBOOKS:

REFERENCES:
OBJECTIVES:
- To apprise the students about the basics of Finite Element theory, computer implementation of this theory and its practical applications.

UNIT I INTRODUCTION TO FINITE ELEMENT ANALYSIS AND FINITE ELEMENT FORMULATION TECHNIQUES


UNIT II ELEMENT PROPERTIES

Natural Coordinates - Triangular Elements - Rectangular Elements - Lagrange and Serendipity Elements - Solid Elements - Isoparametric Formulation - Stiffness Matrix of Isoparametric Elements - Numerical Integration: One, Two and Three Dimensional

UNIT III ANALYSIS OF FRAME STRUCTURES

Stiffness of Truss Members - Analysis of Truss - Stiffness of Beam Members - Finite Element Analysis of Continuous Beam - Plane Frame Analysis - Analysis of Grid and Space Frame.

UNIT IV FEM FOR TWO AND THREE DIMENSIONAL SOLIDS

Constant Strain Triangle - Linear Strain Triangle - Rectangular Elements - Numerical Evaluation of Element Stiffness - Computation of Stresses, Geometric Nonlinearity and Static Condensation - Axisymmetric Element - Finite Element Formulation of Axisymmetric Element - Finite Element Formulation for 3 Dimensional Elements

UNIT V APPLICATIONS OF FEM

Plate Bending Problems - Finite Elements for Elastic Stability - Finite Elements in Fluid Mechanics - Dynamic Analysis

OUTCOMES:
- Students will be in a position to develop computer codes for any physical problems using FE techniques.

TEXTBOOKS:

REFERENCES:
OBJECTIVES:
- To make the students to gain 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 STRENGTH AND DURABILITY OF CONCRETE
Quality assurance for concrete – Strength, Durability and Thermal properties, of concrete - Cracks, different types, causes – Effects due to climate, temperature, Sustained elevated temperature, Corrosion - Effects of cover thickness.

UNIT III SPECIAL CONCRETES

UNIT IV TECHNIQUES FOR REPAIR AND PROTECTION METHODS
Non-destructive Testing Techniques, Epoxy injection, Shoring, Underpinning, Corrosion protection techniques – Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection.

UNIT V REPAIR, REHABILITATION AND RETROFITTING OF STRUCTURES
Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, Leakage, earthquake – DEMOLITION TECHNIQUES - Engineered demolition methods - Case studies.

TOTAL: 45 PERIODS

OUTCOMES:
- Students must gained knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.

TEXTBOOKS:

REFERENCES:
OBJECTIVES:
- To understand the dynamics of earth and to estimate dynamic properties of soils
- To develop the site specific design spectrum for design of sub structure and evaluation of liquefaction potential.

UNIT I   SEISMOLOGY AND EARTQUAKES  7

UNIT II   DYNAMIC PROPERTIES OF SOILS  11

UNIT III   SEISMIC HAZARD ANALYSIS  9

UNIT IV   GROUND RESPONSE ANALYSIS  9

UNIT V   LIQUEFACTION ANALYSIS  9

OUTCOMES:
- Students are able to perform site specific response analysis to develop design spectra and to do detailed liquefaction analysis using SPT data.

TEXTBOOKS:

REFERENCES: