## ANNA UNIVERSITY, CHENNAI

**AFFILIATED INSTITUTIONS**

**R - 2013**

**B.E. AUTOMOBILE ENGINEERING**

**I – VIII SEMESTERS CURRICULUM AND SYLLABUS**

### SEMESTER I

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#### SEMESTER VII

**ELECTIVE – II**

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#### SEMESTER VIII

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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 - 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 - Describing a simple process (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 - Descriptive 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 - Reading comprehension exercises - 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
- Project
- Assignment
- Reviews
- Creative writing
- Poster making, etc.

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

UNIT II SEQUENCES AND SERIES
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

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.

TEXT BOOKS:

REFERENCES:

PH6151 ENGINEERING PHYSICS – I

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

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


UNIT III  QUANTUM PHYSICS


UNIT IV  ACOUSTICS AND ULTRASONICS


Production of ultrasonics 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.

TOTAL: 45 PERIODS

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.

TEXT BOOKS:
1. Arumugam M. Engineering Physics. Anuradha publishers, 2010

REFERENCES:
1. Searls and Zemansky. University Physics, 2009
5. Rajagopal K. Engineering Physics. PHI, New Delhi, 2011
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 polydispersity 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 isochore (problems).

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY


UNIT IV PHASE RULE AND ALLOYS


UNIT V NANOCHEMISTRY

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

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.

TEXT BOOKS:

REFERENCES:

GE6151 COMPUTER PROGRAMMING

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.

TOTAL: 45 PERIODS

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:  

GE6152  ENGINEERING GRAPHICS  
L T P C  2 0 3 4

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  

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.

TEXT BOOK:

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

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.
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.
(c) 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

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.

TOTAL: 30 PERIODS

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

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

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

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

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.

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

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%

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  9+3
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  9+3

UNIT IV  ANALYTIC FUNCTIONS  9+3
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  9+3
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.

TEXT BOOKS:

REFERENCES:
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
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

UNIT V  ADVANCED ENGINEERING MATERIALS
Metallic glasses: preparation, properties and applications. Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, Nanomaterials— Preparation -pulsed laser deposition – chemical vapour deposition – Applications – NLO materials –Birefringence optical Kerr effect – Classification of Biomaterials and its applications

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.

TEXT BOOKS:

REFERENCES:
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
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 – refactoriness 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.

TEXT BOOKS:

REFERENCES:

GE6252 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING L T P C 4 0 0 4

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

Communication Systems: Radio, TV, Fax, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).

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:


GE6253  ENGINEERING MECHANICS  L T P C

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
Free body diagram – Types of supports –Action and reaction forces –stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon’s theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

UNIT III  PROPERTIES OF SURFACES AND SOLIDS  12
UNIT IV DYNAMICS OF PARTICLES

UNIT V FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS
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.

TEXT BOOKS:

REFERENCES:

GE6261 COMPUTER AIDED DRAFTING AND MODELING LABORATORY

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 B spline 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>

GE6262                         PHYSICS AND CHEMISTRY LABORATORY – II
L T P C
0 0 2 1

PHYSICS LABORATORY – II

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, porcelain tile, dropper (30 Nos each)
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 a 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
Dirichlet's conditions -- General Fourier series -- Odd and even functions -- Half range sine series -- Half range cosine series -- Complex form of Fourier series -- Parseval's identity -- Harmonic analysis.

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  9 + 3

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:

ME6301 ENGINEERING THERMODYNAMICS

OBJECTIVES:
- To familiarize the students to understand the fundamentals of thermodynamics and to perform thermal analysis on their behavior and performance.

(Use of Standard and approved Steam Table, Mollier Chart, Compressibility Chart and Psychrometric Chart permitted)

UNIT I BASIC CONCEPTS AND FIRST LAW

UNIT II SECOND LAW AND AVAILABILITY ANALYSIS

UNIT III PROPERTIES OF PURE SUBSTANCE AND STEAM POWER CYCLE

UNIT IV IDEAL AND REAL GASES, THERMODYNAMIC RELATIONS
UNIT V  GAS MIXTURES AND PSYCHROMETRY  
Mole and Mass fraction, Dalton’s and Amagat’s Law. Properties of gas mixture – Molar mass, gas constant, density, change in internal energy, enthalpy, entropy and Gibbs function. Psychrometric properties, Psychrometric charts. Property calculations of air vapour mixtures by using chart and expressions. Psychrometric process – adiabatic saturation, sensible heating and cooling, humidification, dehumidification, evaporative cooling and adiabatic mixing. Simple Applications

TOTAL : 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to apply the Thermodynamic Principles to Mechanical Engineering Application.
- Apply mathematical fundamentals to study the properties of steam, gas and gas mixtures.

TEXT BOOKS :

REFERENCES :

CE6451  FLUID MECHANICS AND MACHINERY  
L T P C  3 0 0 3

OBJECTIVES:
- The applications of the conservation laws to flow through pipes and hydraulic machines are studied
- To understand the importance of dimensional analysis.
- To understand the importance of various types of flow in pumps and turbines.

UNIT I  FLUID PROPERTIES AND FLOW CHARACTERISTICS  
Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, surface tension and capillarity. Flow characteristics – concept of control volume - application of continuity equation, energy equation and momentum equation.

UNIT II  FLOW THROUGH CIRCULAR CONDUITS  
UNIT III  DIMENSIONAL ANALYSIS

Need for dimensional analysis – methods of dimensional analysis – Similitude –types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis.

UNIT IV  PUMPS


UNIT V  TURBINES


TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to apply mathematical knowledge to predict the properties and characteristics of a fluid.
- Can critically analyse the performance of pumps and turbines.

TEXT BOOK:

REFERENCES:

AT6301  AUTOMOTIVE ENGINES

OBJECTIVES:
- To understand the basic principles of engines used for automobiles and different systems.

UNIT I  CONSTRUCTION AND OPERATION


UNIT II  FUEL SYSTEMS

UNIT III  
COMBUSTION AND COMBUSTION CHAMBERS  

UNIT IV  
SUPERCHARGING, TURBOCHARGING AND ENGINE TESTING  
Supercharging and Turbocharging, Different methods of turbocharging, Intercooling, Turbocharger controls including, waster gate, variable geometry, variable nozzle types. Dynamometers, Indicated thermal, brake thermal and volumetric efficiencies. Measurement of friction, Cylinder pressure measurement. Engine performance maps, Engine testing standards.

UNIT V  
COOLING AND LUBRICATION SYSTEMS  
Need for cooling, types of cooling systems- air and liquid cooling systems. Thermo syphon and forced circulation and pressurized cooling systems. Properties of coolants. Requirements of lubrication systems. Types-mist, pressure feed, dry and wet sump systems. Properties of lubricants.

OUTCOMES:
- The main objective of this course is to impart knowledge in automotive engine. The detailed concept, construction and principle of operation of engine and various engine components, combustion, cooling and lubrication systems will be taught to the students. At the end of the course the students will have command over automotive engines and the recent development in the area of engines.

TEXT BOOKS:

REFERENCES:

AT6302  
MECHANICS OF MACHINES  
L T P C  
3 1 0 4

OBJECTIVES:
- To understand the principles in the formation of mechanisms and their kinematics.
- To understand the effect of friction in different machine elements.
- To analyse the forces and toques acting on simple mechanical systems
- To understand the importance of balancing and vibration.

UNIT I  
KINEMATIC OF MECHANICS  
Mechanisms – Terminology and definitions – kinematics inversions of 4 bar and slide crank chain – kinematics analysis in simple mechanisms – velocity and acceleration polygons – Analytical methods

UNIT II  GEARs and GEAR TRAINS  9

UNIT III  FRICTION  8

UNIT IV  FORCE ANALYSIS  9

UNIT V  BALANCING AND VIBRATION  9

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

OUTCOMES:
• Upon completion of this course, the students can able to apply mathematical knowledge to predict the properties and characteristics of a fluid.
• Can critically analyse the performance of pumps and turbines.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- The automobile components such as piston, connecting rod, crankshaft, engine block, front axle, frame, body etc., are manufactured by various types of production processes involving casting, welding, machining, metal forming, power metallurgy etc. Hence B.E. Automobile Engineering students must study this course Production Technology.

UNIT I CASTING 8
Casting types, procedure to make sand mould, types of core making, moulding tools, machine moulding, special moulding processes – CO2 moulding; shell moulding, investment moulding, permanent mould casting, pressure die casting, centrifugal casting, continuous casting, casting defects.

UNIT II WELDING 8

UNIT III MACHINING 13
General principles (with schematic diagrams only) of working and commonly performed operations in the following machines: Lathe, Shaper, Planer, Horizontal milling machine, Universal drilling machine, Cylindrical grinding machine, Capstan and Turret lathe. Basics of CNC machines. General principles and applications of the following processes: Abrasive jet machining, Ultrasonic machining, Electric discharge machining, Electro chemical machining, Plasma arc machining, Electron beam machining and Laser beam machining.

UNIT IV FORMING AND SHAPING OF PLASTICS 7

UNIT V METAL FORMING AND POWDER METALLURGY 9
Principles and applications of the following processes: Forging, Rolling, Extrusion, Wire drawing and Spinning, Powder metallurgy – Principal steps involved advantages, disadvantages and limitations of powder metallurgy.

TOTAL: 45 PERIODS

OUTCOMES:

- The Students can able to use different manufacturing process and use this in industry for component production

TEXT BOOKS:
REFERENCES:

AT6311 AUTOMOTIVE COMPONENTS LABORATORY  L T P C 0 0 3 2

OBJECTIVES:
- To train the Students to know the details of different components, dismantle and assembling them.

LIST OF EXPERIMENTS
1. Dismantling and study of Multi-cylinder Petrol Engine
2. Assembling of Multi-cylinder Petrol Engine
3. Dismantling and study of Multi-cylinder Diesel Engine
4. Assembling of Multi-cylinder Diesel Engine
5. Study of petrol engine fuel system
6. Study of diesel engine fuel system
7. Study and measurement of light and heavy commercial
8. Vehicle Frame
9. Study, dismantling and assembling of front and rear
10. Axles
11. Study, dismantling and assembling of differential
12. Study, dismantling and assembling of Clutch
13. Study, dismantling and assembling of Gear Box
14. Study of steering system

OUTCOMES
- Ability to dismantle and assemble the automobile components

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S. No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Multi Cylinder Petrol Engine</td>
<td>2 No.</td>
</tr>
<tr>
<td>2</td>
<td>Multi Cylinder Diesel Engine</td>
<td>2 No.</td>
</tr>
<tr>
<td>3</td>
<td>Petrol and Diesel fuel systems</td>
<td>2 No. Each</td>
</tr>
<tr>
<td>4</td>
<td>Heavy duty vehicle chassis frame</td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td>Light duty vehicle chassis frame</td>
<td>1 No.</td>
</tr>
<tr>
<td>6</td>
<td>Front axle</td>
<td>2 No.</td>
</tr>
<tr>
<td>7</td>
<td>Rear axle</td>
<td>2 No.</td>
</tr>
<tr>
<td>8</td>
<td>Differential</td>
<td>2 No.</td>
</tr>
<tr>
<td>9</td>
<td>Clutch and Gear box (light duty, heavy duty)</td>
<td>2 No. Each</td>
</tr>
<tr>
<td>10</td>
<td>Steering systems with different gearboxes</td>
<td>4 No.</td>
</tr>
</tbody>
</table>
OBJECTIVES:
- Upon Completion of this subject, the students can have hands-on experience in flow measurements using different devices and also perform calculation related to losses in pipes and also perform characteristic study of pumps, turbines etc.,

LIST OF EXPERIMENTS
1. Determination of the Coefficient of discharge of given Orifice meter.
2. Determination of the Coefficient of discharge of given Venturi meter.
3. Calculation of the rate of flow using Rota meter.
4. Determination of friction factor for a given set of pipes.
5. Conducting experiments and drawing the characteristic curves of centrifugal pump/submergible pump
6. Conducting experiments and drawing the characteristic curves of reciprocating pump.
7. Conducting experiments and drawing the characteristic curves of Gear pump.
8. Conducting experiments and drawing the characteristic curves of Pelton wheel.
9. Conducting experiments and drawing the characteristics curves of Francis turbine.
10. Conducting experiments and drawing the characteristic curves of Kaplan turbine.

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to use the measurement equipments for flow measurement
- Ability to do performance trust on different fluid machinery

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S. No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Orifice meter setup</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Venturi meter setup</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Rotameter setup</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Pipe Flow analysis setup</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Centrifugal pump/submergible pump setup</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Reciprocating pump setup</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Gear pump setup</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Pelton wheel setup</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Francis turbine setup</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Kaplan turbine setup</td>
<td>1</td>
</tr>
</tbody>
</table>

TOTAL: 45 PERIODS

OBJECTIVES:
- Demonstration and study of the various machines. The Main emphasis will be on a complete understanding of the machine capabilities and processes.
LIST OF EXPERIMENTS

UNIT I   LATHE PRACTICE
a. Plain Turning  
b. Taper Turning  
c. Thread Cutting  
Estimation of machining time for the above turning processes.

UNIT II  DRILLING PRACTICE
a. Drilling  
b. Tapping  
c. Reaming.

UNIT III  MILLING
a. Surface Milling.  
b. Gear Cutting.  
c. Contour Milling.

UNIT IV  PLANNING AND SHAPING
a. Cutting Key Ways.  
b. Dove tail machining.  
TOTAL: 45 PERIODS

OUTCOMES:
• Ability to use different machine tools to manufacturing gears.  
• Ability to use different machine tools for finishing operations  
• Ability to manufacture tools using cutter grinder  
• Develop CNC part programming

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S. No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lathe</td>
<td>15 Nos.</td>
</tr>
<tr>
<td>2</td>
<td>Drilling Machine</td>
<td>1 No.</td>
</tr>
<tr>
<td>3</td>
<td>Milling Machine</td>
<td>2 Nos.</td>
</tr>
<tr>
<td>4</td>
<td>Planning Machine</td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td>Shaping Machine</td>
<td>2 Nos.</td>
</tr>
</tbody>
</table>

MA6452   STATISTICS AND NUMERICAL METHODS  
L T P C  
3 1 0 4

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

UNIT I   TESTING OF HYPOTHESIS
Large sample test based on Normal distribution for single mean and difference of means - Tests based on t, \( \chi^2 \) and F distributions for testing means and variances – Contingency table (Test for Independency) – Goodness of fit.
UNIT II   DESIGN OF EXPERIMENTS  9+3
One way and two way classifications - Completely randomized design – Randomized block design –
Latin square design - $2^2$ factorial design.

UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS  9+3
values of a matrix by power method.

UNIT IV   INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL
INTEGRATION  9+3
Lagrange’s and Newton’s divided difference interpolations – Newton’s forward and backward
difference interpolation – Approximation of derivates using interpolation polynomials – Numerical
single and double integrations using Trapezoidal and Simpson’s 1/3 rules.

UNIT V   NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS  9+3
Taylor’s series method – Euler’s method – Modified Euler’s method – Fourth order Runge-Kutta
method for solving first order equations – Milne’s predictor corrector methods for solving first order
equations – Finite difference methods for solving second order equations.

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

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

TEXT BOOKS:

REFERENCES:
   Hill, New Delhi, 2007.
   Delhi, 2006.

AT6401 APPLIED THERMODYNAMICS AND HEAT TRANSFER  L T P C
3 1 0 4

OBJECTIVES:
• To familiarize the students to understand the applied thermodynamics and heat transfer.

   (Use of Standard and approved Steam Table, Mollier Chart, Compressibility Chart and
   Psychrometric Chart permitted)

40
UNIT I  GAS POWER CYCLES
Air standard cycles-Otto-Diesel-Dual-Work output, Efficiency and MEP calculations – comparison of the cycles for same compression ratio and heat addition, same compression ratio and heat rejection, same peak pressure, peak temperature and heat rejection, same peak pressure and heat input, same peak pressure and work output, Brayton cycle

UNIT II  RECIPROCATING AIRCOMPRESSORS & REFRIGERATION CYCLES

UNIT III  CONDUCTION

UNIT IV  CONVECTION

UNIT V  RADIATION

OUTCOMES:
• It helps the students to have a clear idea of application of thermodynamics and heat transfer. The student would be able to identify the applications of these techniques in their engineering fields.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To impart knowledge on the structure, properties, treatment, testing and applications of metals and non-metallic materials so as to identify and select suitable materials for various engineering applications.

UNIT I ALLOYS AND PHASE DIAGRAMS

UNIT II HEAT TREATMENT

UNIT III FERROUS AND NON-FERROUS METALS

UNIT IV NON-METALLIC MATERIALS
Polymers – types of polymer, commodity and engineering polymers – Properties and applications of various thermosetting and thermoplastic polymers (PP, PS, PVC, PMMA, PET,PC, PA, ABS, PI, PAI, PPO, PPS, PEEK, PTFE, Polymers – Urea and Phenol formaldehydes)- Engineering Ceramics – Properties and applications of Al₂O₃, SiC, Si₃N₄, PSZ and SIALON –Composites-Classifications- Metal Matrix and FRP - Applications of Composites.

UNIT V MECHANICAL PROPERTIES AND DEFORMATION MECHANISMS

OUTCOMES:
- Upon completion of this course, the students can able to use different materials, their processing, heat treatments in suitable application in mechanical engineering fields.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
To understand the stresses developed in bars, compounds bars, beams, shafts, cylinders and spheres.

UNIT I  STRESS, STRAIN AND DEFORMATION OF SOLIDS

UNIT II  TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM

UNIT III  TORSION
Torsion formulation stresses and deformation in circular and hollows shafts – Stepped shafts – Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs.

UNIT IV  DEFLECTION OF BEAMS
Double Integration method – Macaulay’s method – Area moment method for computation of slopes and deflections in beams - Conjugate beam and strain energy – Maxwell’s reciprocal theorems.

UNIT V  THIN CYLINDERS, SPHERES AND THICK CYLINDERS
Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin and thick cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lame’s theorem.

OUTCOMES:
- Upon completion of this course, the students can able to apply mathematical knowledge to calculate the deformation behavior of simple structures.
- Critically analyse problem and solve the problems related to mechanical elements and analyse the deformation behavior for different types of loads.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
• To enable the students to understand the fundamental concepts of Semi Conductors, Transistors, Rectifiers, Digital Electronics and 8085 Microprocessors

UNIT I SEMICONDUCTORS AND RECTIFIERS
Classification of solids based on energy band theory-Intrinsic semiconductors-Extrinsic semiconductors-P type and N type-PN junction-Zenor effect-Zenor diode characteristics- Half wave and full wave rectifiers -Voltage regulation

UNIT II TRANSISTORS AND AMPLIFIERS
Bipolar junction transistor- CB, CE, CC configuration and characteristics-Biasing circuits- Class A, B and C amplifiers- Field effect transistor-Configuration and characteristic of FET amplifier-SCR, Diac, Triac, UJT-Characteristics and simple applications-Switching transistors-Concept of feedback-Negative feedback-Application in temperature and motor speed control.

UNIT III DIGITAL ELECTRONICS
Binary number system - AND, OR, NOT, NAND, NOR circuits-Boolean algebra- Exclusive OR gate - Flip flops-Half and full adders-Registers-Counters-A/D and D/A conversion.

UNIT IV 8085 MICROPROCESSOR
Block diagram of microcomputer-Architecture of 8085-Pin configuration-Instruction set- Addressing modes-Simple programs using arithmetic and logical operations.

UNIT V INTERFACING AND APPLICATIONS OF MICROPROCESSOR
Basic interfacing concepts - Interfacing of Input and Output devices-Applications of microprocessor Temperature control, Stepper motor control, traffic light control.

OUTCOMES:
• The students will be well versed in the fundamental knowledge of electronic and its applications.

TEXT BOOKS

REFERENCES
OBJECTIVES:
- Study of the Constructional details and Theory of important drive line, Structural, Steering, Braking and Suspension Systems of Automobiles. Problem–Solving in Steering Mechanism, Propeller Shaft, Braking and Suspension Systems are to be done.

UNIT I LAYOUT, FRAME, FRONT AXLE AND STEERING SYSTEM

UNIT II DRIVE LINE, FINAL DRIVE AND DIFFERENTIAL

UNIT III REAR AXLES, WHEELS, RIMS AND TYRES

UNIT IV SUSPENSION SYSTEM

UNIT V BRAKE SYSTEMS

OUTCOMES
- The students will understand the constructional, working principle of various sub system of an automobile.

TEXT BOOKS

REFERENCES
OBJECTIVES:

- To introduce the students the Indian standard code of practice for engineering drawing and general symbols and abbreviation used on the drawing.
- To provide hands-on experience to develop 2D and 3D models of engineering components.

LIST OF EXPERIMENTS

1. Drawing of automobile components such as piston, connecting rod, valves, manifold and crankshaft.
2. Assembly drawing of screw jack, piston – connecting rod assembly, valve assembly, clutch assembly and gear box assembly.

OUTCOMES

- Ability to develop engineering drawing for the industrial component using Indian Standard code of practice.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S. No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Computer nodes</td>
<td>30 Nos.</td>
</tr>
<tr>
<td>2</td>
<td>Software</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drafting Software</td>
<td>15 licenses</td>
</tr>
<tr>
<td></td>
<td>Modeling Software -</td>
<td>5 Nos.</td>
</tr>
</tbody>
</table>

OBJECTIVES:

- To supplement the theoretical knowledge with practical use of electronic components and programming and control using micro-processors.

LIST OF EXPERIMENTS

ELECTRONICS

1. VI Characteristics of PN Junction Diode
2. VI Characteristics of Zener Diode
3. Characteristics of CE Transistor
4. Characteristics of JFET
5. Characteristics of Uni Junction Transistor
6. RC or Wein Bridge Oscillator
7. Study of Logic Gates (Basic Gates)
8. Half Adder and Full Adder
9. Shift Registers and Counters
10. Operational Amplifier (Adder, Subtractor, Differentiator, Integrator, Inverting and Non – Inverting
MICROPROCESSORS
1. Block Transfer
2. 8 bit Addition, Subtraction
3. Multiplication and Division
4. Maximum and Minimum of block of data
5. Sorting
6. Stepper Motor Interfacing

TOTAL : 45 PERIODS

OUTCOMES:
• Ability to perform speed characteristic of different electronics and microprocessor machine

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S. No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Voltmeters</td>
<td>5 Nos.</td>
</tr>
<tr>
<td>2</td>
<td>Ammeters</td>
<td>5 Nos.</td>
</tr>
<tr>
<td>3</td>
<td>PN Diode, BJT, JFET, Logic Gates, Shift Registers and Counters</td>
<td>1 set.</td>
</tr>
<tr>
<td>4</td>
<td>Digital Logic Trainer Kits</td>
<td>1 No</td>
</tr>
<tr>
<td>5</td>
<td>Breadboards</td>
<td>1 No</td>
</tr>
<tr>
<td>6</td>
<td>Microprocessor Kits – 8085</td>
<td>5 Nos.</td>
</tr>
<tr>
<td>7</td>
<td>D/A Converter Interface</td>
<td>1 No</td>
</tr>
<tr>
<td>8</td>
<td>Stepper Motor Interface</td>
<td>1 No.</td>
</tr>
<tr>
<td>9</td>
<td>CRO</td>
<td>1 No.</td>
</tr>
<tr>
<td>10</td>
<td>Waveform Generator</td>
<td>1 No.</td>
</tr>
<tr>
<td>11</td>
<td>Multimeter</td>
<td>1 No.</td>
</tr>
</tbody>
</table>

CE6315 STRENGTH OF MATERIALS LABORATORY L T P C
0 0 3 2

OBJECTIVES
To supplement the theoretical knowledge gained in Mechanics of Solids with practical testing for determining the strength of materials under externally applied loads. This would enable the student to have a clear understanding of the design for strength and stiffness

LIST OF EXPERIMENTS
1. Tension test on a mild steel rod
2. Double shear test on Mild steel and Aluminium rods
3. Torsion test on mild steel rod
4. Impact test on metal specimen
5. Hardness test on metals - Brinnell and Rockwell Hardness Number
6. Deflection test on beams
7. Compression test on helical springs
8. Strain Measurement using Rosette strain gauge
10. Tempering- Improvement Mechanical properties Comparison
   (i) Unhardened specimen
(ii) Quenched Specimen and
(iii) Quenched and tempered specimen.

11. Microscopic Examination of
(i) Hardened samples and
(ii) Hardened and tempered samples.

OUTCOMES:
- Ability to perform different destructive testing
- Ability to characterize materials

LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Universal Tensile Testing machine with double 1 shear attachment – 40 Ton Capacity</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Torsion Testing Machine (60 NM Capacity)</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Impact Testing Machine (300 J Capacity)</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Brinell Hardness Testing Machine</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Rockwell Hardness Testing Machine</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Spring Testing Machine for tensile and compressive loads (2500 N)</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Metallurgical Microscopes</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Muffle Furnace (800 C)</td>
<td>1</td>
</tr>
</tbody>
</table>

GE6351 ENVIRONMENTAL SCIENCE AND ENGINEERING

OBJECTIVES:
To the study of nature and the 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 SO$_2$, NO$_x$, 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

TEXT BOOKS:

REFERENCES:

ME6503 DESIGN OF MACHINE ELEMENTS

OBJECTIVES:
- To familiarize the various steps involved in the Design Process
- To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.
- To learn to use standard practices and standard data
- To learn to use catalogues and standard machine components
  (Use of P S G Design Data Book is permitted)

UNIT I STEADY STRESSES AND VARIABLE STRESSES IN MACHINE MEMBERS 10

UNIT II SHAFTS AND COUPLINGS 8
Design of solid and hollow shafts based on strength, rigidity and critical speed – Keys, keyways and splines – crankshafts - Rigid and flexible couplings.

UNIT III TEMPORARY AND PERMANENT JOINTS 9
Threaded fastners - Bolted joints including eccentric loading, Knuckle joints, Cotter joints – Welded joints, riveted joints for structures - theory of bonded joints.
UNIT IV ENERGY STORING ELEMENTS AND ENGINE COMPONENTS
Various types of springs, optimization of helical springs - rubber springs - Flywheels considering stresses in rims and arms for engines and punching machines- Connecting Rods and crank shafts.

UNIT V BEARINGS
Sliding contact and rolling contact bearings - Hydrodynamic journal bearings, Sommerfeld Number, Raimondi and Boyd graphs, -- Selection of Rolling Contact bearings.

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to apply the successfully design various mechanical components

TEXT BOOKS:

REFERENCES:

AT6501 AUTOMOTIVE TRANSMISSION

OBJECTIVES:
- To know about the various transmission and drive line units of automobiles.

UNIT I CLUTCH AND GEAR BOX
Requirement of transmission system, Different types of clutches, principle & Construction of Single plate coil spring and Diaphragm spring clutches., Need and Objectives of Gear box. Construction and operation of Sliding mesh, Constant mesh and Synchromesh gearboxes. – Determination of gear ratios for vehicles. Performance characteristics in different speeds. Problems on performance of automobile such as Resistance to motion, Tractive effort, Engine speed & Power and acceleration.

UNIT II HYDRODYNAMIC TRANSMISSION
UNIT III  EPICYCLIC GEARBOXES USED IN AUTOMATIC TRANSMISSION  

UNIT IV  AUTOMATIC TRANSMISSION APPLICATIONS  
Need for automatic transmission, Four speed longitudinally mounted automatic transmission - Chevrolet “Turboglide” Transmission, Continuously Variable Transmission (CVT) – Types – Operations of a typical CVT.

UNIT V  HYDROSTATIC AND ELECTRIC DRIVE  

TOTAL : 45 PERIODS

OUTCOMES
- The students will understand the constructional, working principle of various types of manual and automotive transmission of an automobile.

TEXT BOOKS:

REFERENCES:
1. SAE Transactions 900550 & 930910.

AT6502  AUTOMOTIVE ELECTRICAL AND ELECTRONICS SYSTEMS

OBJECTIVES
- Knowledge in vehicle electrical and electronics components for engine operation.
- Enhancing the knowledge of reversor and microprocessor applications in vehicle control systems.
- Gaining information’s on modern safety system in vehicle braking.

UNIT I  BATTERIES AND STARTING SYSTEM
Different types of Batteries – principle, rating, testing and charging. Starter motors characteristics, capacity requirements. Drive mechanisms. Starter switches.

UNIT II  CHARGING SYSTEM LIGHTING AND ACCESSORIES
UNIT III ELECTRONIC IGNITION AND INJECTION SYSTEM
Spark plugs. Advance mechanisms. Different types of ignition systems. Electronic fuel injection systems, mono and multi point fuel injection system (MPFI).

UNIT IV SENSORS AND MICROPROCESSORS IN AUTOMOBILES
Basic sensor arrangements. Types of sensors – oxygen sensor, hot wire anaemometer sensor, vehicle speed sensor, detonation sensor, accelerometer sensor, crank position sensor. Microprocessor and microcomputer controlled devices in automobiles such voice warning system, travel information system, keyless entry system, automatic transmission system, electronic steering system.

UNIT V SAFETY SYSTEMS
Antilock braking system, air bag restraint system, voice warning system, seat belt system, road navigation system, anti theft system.

OUTCOMES:
- The student will have to know about all theoretical information and about electrical components used in a vehicle.

TEXTBOOK:

REFERENCES:

AT6503 VEHICLE DESIGN AND DATA CHARACTERISTICS

OBJECTIVES:
- Students have to collect important technical specifications of an automobile from Automobile Journals and keeping this, as a guide, they have to calculate and tabulate various vehicle performance parameters and design parameters and to draw curves using these data.

UNIT I INTRODUCTION
Assumptions to be made in designing a vehicle, Range of values for Gross Vehicle Weight, Frontal Area, maximum speed, maximum acceleration, gradability in different gears, Basics of Automobile Design.

UNIT II RESISTANCE TO VEHICLE MOTION
Calculation, Tabulation and Plotting of Curves for Air and Rolling Resistances at various vehicle speeds, Calculation and Plotting of Driving force, Power requirement for different loads and acceleration, Maximum Power calculation.
UNIT III  PERFORMANCE CURVES – I
Calculation, Tabulation and Plotting of Torque and Mechanical Efficiency for different vehicle speeds, Interpolation of Pressure – Volume diagram, Calculation of frictional Mean Effective Pressure, Calculation of Engine Cubic Capacity, Bore and Stroke Length.

UNIT IV  PERFORMANCE CURVES – II
Connecting rod length to Crank Radius Ratio, Plotting of Piston Velocity and Acceleration against Crank Angle, Plotting Gas force, inertia force and Resultant force against Crank Angle, Turning Moment and Side Thrust against Crank Angle.

UNIT V  GEAR RATIOS
Determination of Gear Ratios, Acceleration and Gradability, Typical Problems on Vehicle performance

OUTCOMES
• The students can able to understand the basic design principle of vehicle, able to draw the performance curves pertain to engine and chassis.

TEXT BOOKS

REFERENCE:  

AT6504  AUTOMOTIVE FUELS AND LUBRICANTS  L T P C
3 0 0 3

OBJECTIVES:
• To understand the properties of fuels and lubricants for the design and operation of the I.C engines.

UNIT I  MANUFACTURE OF FUELS AND LUBRICANTS
Structure of petroleum, refining process, fuels, thermal cracking, catalytic cracking, polymerization, alkylation, isomerisation, blending, products of refining process. Manufacture of lubricating oil base stocks, manufacture of finished automotive lubricants.

UNIT II  THEORY OF LUBRICATION
Engine friction: introduction, total engine friction, effect of engine variables on friction, hydrodynamic lubrication, elasto hydrodynamic lubrication, boundary lubrication, bearing lubrication, functions of the lubrication system, introduction to design of a lubricating system.

UNIT III  LUBRICANTS
Specific requirements for automotive lubricants, oxidation deterioration and degradation of lubricants, additives and additive mechanism, synthetic lubricants, classification of lubricating oils, properties of lubricating oils, tests on lubricants. Grease, classification, properties, test used in grease.
UNIT IV PROPERTIES AND TESTING OF FUELS
Thermo-chemistry of fuels, properties and testing of fuels, relative density, calorific value, flash point, fire point, distillation, vapour pressure, spontaneous ignition temperature, viscosity, pour point, flammability, ignitability, diesel index, API gravity, aniline point, carbon residue, copper strip corrosion etc.

UNIT V COMBUSTION & FUEL RATING

TOTAL : 45 PERIODS

OUTCOMES:
- At the end of the course, the student can understand the importance, manufacturing methods, testing methods, combustion methodology of automotive fuels and lubricants.

TEXT BOOKS:

REFERENCES:

GE6563 COMMUNICATION SKILLS – LABORATORY BASED

OBJECTIVES:
- To provide opportunities to learners to practice their communicative skills to make them become proficient users of English.
- To enable learners to fine-tune their linguistic skills (LSRW) with the help of technology to communicate globally.
- To enhance the performance of learners at placement interviews and group discussions and other recruitment procedures.

UNIT I LISTENING / VIEWING
Listening and note-taking – Listening to telephonic conversations – Ted talks – Inspiring Speeches – Watching documentaries on personalities, places, socio-cultural events, TV news programmes and discussions to answer different kinds questions, viz., identifying key idea and comprehension questions... so on.
UNIT II    SPEAKING

UNIT III    READING
Different genres of text (literature, media, technical) for comprehension – Reading strategies like note-making – reading graphs, charts and graphic organizer – Sequencing sentences – reading online sources like e-books, e-journals and e-newspapers.

UNIT IV    WRITING

UNIT V    VOCABULARY
Idioms and Phrases – Proverbs – Collocations – Chunks of language.

UNIT VI    GRAMMAR
Sentence structures – Subject-Verb agreement – Pronoun-Antecedent agreement – Tense forms – Active and passive voices – Direct and Indirect speeches – Cohesive devices.

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>
</table>
| 1      | Server
|        | • PIV System                                                            | 1 No.        |
|        | • 1 GB RAM / 40 GB HDD                                                  |              |
|        | • OS: Win 2000 server                                                   |              |
|        | • Audio card with headphones                                           |              |
|        | • JRE 1.3                                                               |              |
| 2      | Client Systems                                                          | 60 Nos.      |
|        | • PIII System                                                           |              |
|        | • 256 or 512 MB RAM / 40 GB HDD                                        |              |
|        | • OS: Win 2000                                                         |              |
|        | • Audio card with headphones                                           |              |
|        | • JRE 1.3                                                               |              |
| 3      | Handicam                                                               | 1 No.        |
| 4      | Television 46”                                                          | 1 No.        |
| 5      | Collar mike                                                            | 1 No.        |
| 6      | Cordless mike                                                           | 1 No.        |
| 7      | Audio Mixer                                                            | 1 No.        |
| 8      | DVD recorder/player                                                     | 1 No.        |
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
- Online Test - 35 marks
- Interview - 15 marks
- Presentation - 15 marks
- Group Discussion - 15 marks

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, case studies and abstract concept

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:

Web Sources:
www.humanresources.about.com
www.careerride.com
OBJECTIVES:
- To introduce the testing procedure for electrical and electronics system in automobile.

LIST OF EXPERIMENTS
a. Electrical Laboratory
1. Testing of batteries and battery maintenance
2. Testing of starting motors and generators
3. Testing of regulators and cut-outs
4. Diagnosis of ignition system faults
5. Study of Automobile electrical wiring

b. Electronics Laboratory
6. Study of rectifiers and filters
7. Study of logic gates, adder and flip-flops
8. Study of SCR and IC timer
9. Interfacing Sensors like RTD, LVDT, Load Cell etc.
10. Interfacing ADC for Data Acquisition
11. Interfacing DAC for Control Application
12. Interfacing A/D converter and simple data acquisition
13. Micro controller programming and interfacing
14. Interfacing Actuators
15. EPROM Programming
16. Fault Diagnosis of various sensors

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to rectify and faults in electrical and electronics systems and maintain the same.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Battery, hydrometer, voltage tester</td>
<td>1 No. each</td>
</tr>
<tr>
<td>2</td>
<td>Starter motor, regulator, cut-out</td>
<td>1 No. each</td>
</tr>
<tr>
<td>3</td>
<td>Distributor, ignition coil, spark plug</td>
<td>1 No. each</td>
</tr>
<tr>
<td>4</td>
<td>Auto electrical wiring system</td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td>Rectifiers, filters</td>
<td>15 Nos. each</td>
</tr>
<tr>
<td>6</td>
<td>Bread board, Logic gates ICs,</td>
<td>15 Nos. each</td>
</tr>
<tr>
<td>7</td>
<td>Amplifier</td>
<td>15 Nos</td>
</tr>
<tr>
<td>8</td>
<td>IC timer</td>
<td>15 Nos</td>
</tr>
<tr>
<td>9</td>
<td>Data logger</td>
<td>1 No.</td>
</tr>
<tr>
<td>10</td>
<td>8085 trainer kit</td>
<td>10 Nos</td>
</tr>
<tr>
<td>11</td>
<td>ADC interface board</td>
<td>2 Nos</td>
</tr>
<tr>
<td>12</td>
<td>DAC interface board</td>
<td>2 Nos</td>
</tr>
<tr>
<td>13</td>
<td>Sensors like RTD, Load cell, LVDT</td>
<td>2 Nos</td>
</tr>
<tr>
<td>14</td>
<td>Actuators like stepper motor</td>
<td>2 Nos</td>
</tr>
</tbody>
</table>
OBJECTIVES:
- To study the characteristics of the fuels and Lubricants used in automobile

LIST OF EXPERIMENTS
2. Study of Octane and Cetane Number of fuels.
3. ASTM distillation test of liquid fuels
4. Aniline Point test of diesel
5. Calorific value of liquid fuel.
7. Reid vapour pressure test.
8. Flash and Fire points of petrol and diesel.
9. Copper strip Corrosion Test
10. Cloud & Pour point Test.
12. Viscosity Index of lubricants & Fuels by Saybolt Viscometer
13. Ash content and Carbon Residue Test
14. Drop point of grease and mechanical penetration in grease.

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to characteristic and chase the fuels and Lubricantes for the automobiles.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Flash and fire point apparatus (for petrol)</td>
<td>1 No.</td>
</tr>
<tr>
<td>2</td>
<td>Aniline point Apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>3</td>
<td>Reid vapor pressure test Apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>4</td>
<td>Bomb and Gas Calorimeters</td>
<td>1 No. each</td>
</tr>
<tr>
<td>5</td>
<td>Carbon Residue Test Apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>6</td>
<td>Copper Strip Corrosion Test Apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>7</td>
<td>Cloud and Pour point Apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>8</td>
<td>Redwood Viscometer</td>
<td>1 No.</td>
</tr>
<tr>
<td>9</td>
<td>Saybolt Viscometer</td>
<td>1 No.</td>
</tr>
<tr>
<td>10</td>
<td>ASTM distillation test Apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>11</td>
<td>Ash content Test Apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>12</td>
<td>Drop point and penetration Apparatus for grease</td>
<td>1 No.</td>
</tr>
</tbody>
</table>

MG6851 PRINCIPLES OF MANAGEMENT

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
Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations , system and
contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.

UNIT II PLANNING 9

UNIT III ORGANISING 9

UNIT IV DIRECTING 9

UNIT V CONTROLLING 9
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

OUTCOME:
- 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

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
• To make the students understand the design concept and principles of various engine components. These concepts and principles are familiarized for design of components.

UNIT I INTRODUCTION
9
Engineering materials - Introduction endurance limit, notch sensitivity. Tolerances, types of tolerances and fits, design considerations for interference fits, surface finish, surface roughness, Rankine’s formula - Tetmajer’s formula - Johnson formula- design of pushrods.

UNIT II DESIGN OF CYLINDER, PISTON AND CONNECTING ROD
9
Choice of material for cylinder and piston, design of cylinder, piston, piston pin, piston rings, piston failures, lubrication of piston assembly. Material for connecting rod, determining minimum length of connecting rod, small end design, shank design, design of big end cap bolts.

UNIT III DESIGN OF CRANKSHAFT
9
Balancing of I.C. engines, significance of firing order. Material for crankshaft, design of crankshaft under bending and twisting, balancing weight calculations, development of short and long crankarms. Front and rear-end details.

UNIT IV DESIGN OF FLYWHEELS
9
Determination of the mass of a flywheel for a given co-efficient of speed fluctuation. Engine flywheel stresses on the rim of the flywheels. Design of hubs and arms of the flywheel, turning moment diagram.

UNIT V DESIGN OF VALVES AND VALVE TRAIN
9

TOTAL: 45 PERIODS

Note: (Use of P S G Design Data Book is permitted in the University examination)

OUTCOMES:
• Upon completion of the course, students will be able to impart knowledge in automotive engine. The detailed concept, construction and principle of operation of engine and various engine components, combustion, cooling and lubrication systems will be taught to the students. At the end of the course the students will have command over automotive engines and the recent development in the area of engines.

TEXT BOOK:

REFERENCES:
OBJECTIVES:
- The student will be able to understand the fundamental principles involved in design of components of automotive chassis, the complete design exercise and arrive at important dimensions of chassis components.

UNIT I VEHICLE FRAME AND SUSPENSION
Study of loads-moments and stresses on frame members. Design of frame for passenger and commercial vehicle - Design of leaf Springs-Coil springs and torsion bar springs.

UNIT II FRONT AXLE AND STEERING SYSTEMS

UNIT III CLUTCH
Design of single plate clutch, multiplate clutch and cone clutch. Torque capacity of clutch. Design of clutch components, Design details of roller and sprag type of clutches.

UNIT IV GEAR BOX
Gear train calculations, layout of gearboxes. Calculation of bearing loads and selection of bearings. Design of three speed and four speed gearboxes.

UNIT V DRIVE LINE AND REAR AXLE
Design of propeller shaft. Design details of final drive gearing. Design details of full floating, semi-floating and three quarter floating rear shafts and rear axle housings and design aspects of final drive.

TOTAL: 45 PERIODS

OUTCOMES
- At the end of the course, the student can able to design the automotive components like frame, suspension systems, axles, clutch, gear box, drive line components etc

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- The aim of this course is to make the students to know and understand the constructional details operating characteristics and vehicle design aspects

UNIT I THE POWER UNIT
Two stroke and four stroke SI & CI engine Construction and Working, merits and demerits, Symmetrical and unsymmetrical valve & port timing diagrams. Scavenging process.

UNIT II FUEL AND IGNITION SYSTEMS
Fuel system – Different circuits in two wheeler fuel systems, fuel injection system. Lubrication system, Ignition systems - Magneto coil and battery coil spark ignition system, Electronic ignition System, Starting system - Kick starter system – Self starter system. Recent technologies.

UNIT III CHASSIS AND SUB-SYSTEMS
Main frame for two and three wheelers, its types, Chassis and different drive systems for two wheelers, Single, multiple plates and centrifugal clutches, Gear box and its and various gear controls in two wheelers. Front and rear suspension systems. Shock absorbers. Panel meters and controls on handle bar, Freewheeling devices

UNIT IV BRAKES AND WHEELS

UNIT V TWO & THREE WHEELERS – CASE STUDY
Case study of Sports bike, Motor cycles, Scooters and Mopeds - Auto rickshaws, Pick up van, Delivery van and Trailer. Servicing and maintenance. Recent developments.

OUTCOMES:
- The students can able to understand the various subsystem of two and three wheeler and also know how it is different from light motors and heavy motor vehicles.

TEXT BOOKS:

REFERENCES:
4. Bryaut, R.V., Vespa "Maintenance and Repair series".
OBJECTIVES

- To know about the application of basic mechanics principles for dynamic analysis of vehicles.

UNIT I  CONCEPT OF VIBRATION


UNIT II  TIRES


UNIT III  VERTICAL DYNAMICS


UNIT IV  LONGITUDINAL DYNAMICS AND CONTROL


UNIT V  LATERAL DYNAMICS


OUTCOMES

- The student will understand how passenger comfort is achieved along with vehicle stability.

TEXT BOOKS:


REFERENCES:

OBJECTIVES:
- To familiarise the students to use modeling software to model engine components and chassis design

LIST OF ENGINE DESIGN EXPERIMENTS
1. Design and drawing of piston, piston pin and piston rings and drawing of these components.
2. Design of connecting rod small end and big end, shank design, design of big end cap, bolts and drawing of the connecting rod assembly.
3. Design of crankshaft, balancing weight calculations.
4. Development of short and long crank arms, front end and rear end details, drawing of the crankshaft assembly.
5. Design and drawing of flywheel.
6. Ring gear design, drawing of the flywheel including the development of ring gear teeth.
7. Design and drawing of the inlet and exhaust valves.
8. Design of cam and camshaft, cam profile generation, drawing of cam and camshaft.

LIST OF CHASSIS DESIGN EXPERIMENTS
CLUTCH
10. Complete design of clutch components.
11. Assembly drawing of clutch using drafting software.

GEAR BOX
12. Gear train calculations.
13. Layout of gear box.
14. Calculation of bearing loads
15. Selection of bearings.
16. Assembly drawing of gear box using drafting software.

DRIVE LINE AND REAR AXLE
17. Design of propeller shaft.
18. Design details of final drive gearing.
19. Design details of full floating, semi-floating and three quarter floating rear shafts and rear axle housings
20. Design aspects of final drive.

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to use the drafting and modeling software for automobile components design
LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S. No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Computer nodes</td>
<td>15 Nos.</td>
</tr>
<tr>
<td>2</td>
<td>Drafting and Modeling Softwares</td>
<td>15 licenses each</td>
</tr>
</tbody>
</table>

AT6612 TWO AND THREE WHEELERS LABORATORY

L T P C
0 0 3 2

OBJECTIVES:

- To train the students to conduct performance test on two and three wheelers
- To train the students to dismantle and assemble the gear box, steering system etc.,

LIST OF EXPERIMENTS

1. Performance test of a two wheeler using chassis dynamometer.
2. Performance test on shock absorber
3. Performance test on coil spring.
4. Two wheeler chain test
5. Brake and Clutch adjustment as per specification.
6. Dismantling and assembling of two wheeler gear box and finding gear ratios
7. Dismantling and assembling of three wheeler box and finding gear ratios
8. Three wheeler brake and clutch play adjustment
9. Dismantling and assembling of three wheeler steering system.
10. Study of three wheeler chassis frame and power transmission system.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to assemble the engine components and conduct performance test on two and three wheelers.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S. No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Two wheeler chassis dynamometer</td>
<td>1 No.</td>
</tr>
<tr>
<td>2</td>
<td>Coil spring test rig</td>
<td>1 No.</td>
</tr>
<tr>
<td>3</td>
<td>Chain tension test rig</td>
<td>1 No.</td>
</tr>
<tr>
<td>4</td>
<td>Shock absorber test rig</td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td>Two-wheeler gearbox</td>
<td>2 Nos.</td>
</tr>
<tr>
<td>6</td>
<td>Two-wheeler clutch</td>
<td>2 Nos.</td>
</tr>
<tr>
<td>7</td>
<td>Three-wheeler brake assembly</td>
<td>2 Nos.</td>
</tr>
<tr>
<td>8</td>
<td>Three-wheeler steering assembly</td>
<td>2 Nos.</td>
</tr>
<tr>
<td>9</td>
<td>Three-wheeler gear box</td>
<td>2 Nos.</td>
</tr>
</tbody>
</table>
OBJECTIVES:
- To explain the principle of engines and vehicle electronic management system and different sensors used in the systems.

UNIT I FUNDAMENTALS OF AUTOMOTIVE ELECTRONICS 10
Microprocessor architecture, open and closed loop control strategies, PID control, Look up tables, introduction to modern control strategies like Fuzzy logic and adaptive control. Parameters to be controlled in SI and CI enignes and in the other parts of the automobile.

UNIT II SENSORS 12
Inductive, Hall effect, hot wire, thermistor, piezo electric, piezoresistive, based sensors. Throttle position, air mass flow, crank shaft position, cam position, engine and wheel speed, steering position, tire pressure, brake pressure, steering torque, fuel level, crash, exhaust oxygen level (two step and linear lambda), knock, engine temperature, manifold temperature and pressure sensors.

UNIT III SI ENGINE MANAGEMENT 13

UNIT IV CI ENGINE MANAGEMENT 13
Fuel injection system parameters affecting combustion, noise and emissions in CI engines. Pilot, main, advanced post injection and retarded post injection. Electronically controlled Unit Injection system. Layout of the common rail fuel injection system. Working of components like fuel injector, fuel pump, rail pressure limiter, flow limiter, EGR valves

UNIT V VEHICLE MANAGEMENT SYSTEMS 12

TOTAL: 60 PERIODS

OUTCOMES:
- At the end of the course, the student will understand the role of various sensor, its construction and working principle and it influence in controlling pollution, enhancing safety of the vehicle.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To introduce the concepts of Mathematical Modeling of Engineering Problems.
- To appreciate the use of FEM to a range of Engineering Problems.

UNIT I  INTRODUCTION

UNIT II  ONE-DIMENSIONAL PROBLEMS

UNIT III  TWO DIMENSIONAL SCALAR VARIABLE PROBLEMS

UNIT IV  TWO DIMENSIONAL VECTOR VARIABLE PROBLEMS
Equations of elasticity – Plane stress, plane strain and axisymmetric problems – Body forces and temperature effects – Stress calculations - Plate and shell elements.

UNIT V  ISOPARAMETRIC FORMULATION

TOTAL : 45 PERIODS

OUTCOMES:
- Upon completion of this course, the Students can able to understand different mathematical Techniques used in FEM analysis and use of them in Structural and thermal problem

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To know about the various methods of maintaining vehicles and their subsystems.

UNIT I MAINTENANCE, WORKSHOP PRACTICES, SAFETY AND TOOLS 10

UNIT II ENGINE AND ENGINE SUBSYSTEM MAINTENANCE 8
General Engine service- Dismantling of Engine components- Engine repair- working on the underside, front, top, ancillaries- Service of basic engine parts, cooling and lubricating system, fuel system, Intake and Exhaust system, electrical system - Electronic fuel injection and engine management service - fault diagnosis- servicing emission controls

UNIT III TRANSMISSION AND DRIVELINE MAINTENANCE 8
Clutch- general checks, adjustment and service- Dismantling, identifying, checking and reassembling transmission, transaxle- road testing- Removing and replacing propeller shaft, servicing of cross and yoke joint and constant velocity joints- Rear axle service points- removing axle shaft and bearings- servicing differential assemblies- fault diagnosis.

UNIT IV STEERING, BRAKE, SUSPENSION, WHEEL MAINTENANCE 11
Inspection, Maintenance and Service of Hydraulic brake, Drum brake, Disc brake, Parking brake. Bleeding of brakes. Inspection, Maintenance and Service of Mc person strut, coil spring, leaf spring, shock absorbers. Dismantling and assembly procedures. Wheel alignment and balance, removing and fitting of tyres, tyre wear and tyre rotation. Inspection, Maintenance and Service of steering linkage, steering column, Rack and pinion steering, Recirculating ball steering service- Worm type steering, power steering system

UNIT V AUTO ELECTRICAL AND AIR CONDITIONING MAINTENANCE 10
Maintenance of batteries, starting system, charging system and body electrical -Fault diagnosis using Scan tools. Maintenance of air conditioning parts like compressor, condenser, expansion valve, evaporator - Replacement of hoses- Leak detection- AC Charging- Fault diagnosis
Vehicle body repair like panel beating, tinkering, soldering, polishing, painting.

TOTAL : 45 PERIODS

OUTCOMES

- Upon the completion of the course, the student can able to understand the importance of maintenance and also the step by step procedure for maintain the various automotive sub systems

TEXT BOOKS
3. Vehicle Service Manuals of reputed manufacturers

REFERENCES
OBJECTIVES:
- The main objective of this course is to impart knowledge in automotive pollution control. The detailed concept of formation and control techniques of pollutants like UBHC, CO, NO$_x$, particulate matter and smoke for both SI and CI engine will be taught to the students. The instruments for measurement of pollutants and emission standards will also be introduced to the students. At the end of the course the students will have command over automotive pollution and control.

UNIT I INTRODUCTION

UNIT II EMISSIONS IN SI ENGINE
Chemistry of SI engine combustion – HC and CO formation in SI engines – NO formation in SI engines – Smoke emissions from SI engines – Effect of operating variables on emission formation.

UNIT III EMISSIONS IN CI ENGINE
Basics of diesel combustion – Smoke emission and its types in diesel engines – NOx emission and its types from diesel engines – Particulate emission in diesel engines. Odor, sulfur and Aldehyde emissions from diesel engines – effect of operating variables on emission formation.

UNIT IV CONTROL TECHNIQUES FOR REDUCTION OF EMISSION

UNIT V TEST PROCEDURE, INSTRUMENTATION & EMISSION MEASUREMENT

TOTAL : 45 PERIODS

OUTCOMES:
- Upon the completion of the course, the student will understand the fundamentals of formation of automobile pollutions in SI and CI Engines, various control techniques, test procedures etc.

TEXT BOOKS:

REFERENCES:
AT6711  ENGINE PERFORMANCE AND EMISSION TESTING LABORATORY  L T P C  0 0 3 2

OBJECTIVES:
- To conduct performance test and emission test on the IC engines.

LIST OF EXPERIMENTS
1. Study of hydraulic, electrical and eddy current dynamometers
2. Valve timing and port timing diagram
3. Performance and emission test on two wheeler SI engine
4. Performance and emission test on automotive multi-cylinder SI engine
5. Performance and emission test on automotive multi-cylinder CI engine
7. Heat balance test on automotive multi-cylinder SI engine
8. Heat balance test on automotive multi-cylinder CI engine
9. Morse test on multi-cylinder SI engine
10. P-θ and P-V diagrams for IC engine with piezo-electric pick up, charge amplifier, angle encoder and PC

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to control the emission and use of different equipments to conduct performance test.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hydraulic dynamometer</td>
<td>1 No.</td>
</tr>
<tr>
<td>2</td>
<td>Eddy current dynamometer</td>
<td>1 No.</td>
</tr>
<tr>
<td>3</td>
<td>Electrical dynamometer</td>
<td>1 No.</td>
</tr>
<tr>
<td>4</td>
<td>Single cylinder two stroke cut section engine</td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td>Single cylinder four stroke cut section engine</td>
<td>1 No.</td>
</tr>
<tr>
<td>6</td>
<td>Two-wheeler engine test rig</td>
<td>1 No.</td>
</tr>
<tr>
<td>7</td>
<td>Automotive multicylinder SI engine test rig with heat balance arrangement</td>
<td>1 No.</td>
</tr>
<tr>
<td>8</td>
<td>Automotive multicylinder CI engine test rig with heat balance arrangement</td>
<td>1 No.</td>
</tr>
<tr>
<td>9</td>
<td>Emission Measuring Instruments for Petrol &amp; Diesel Engines</td>
<td>1 No each</td>
</tr>
<tr>
<td>10</td>
<td>Piezo-electric pick up, Charge Amplifier, Angle Encoder and PC</td>
<td>1 set</td>
</tr>
</tbody>
</table>

AT6712  VEHICLE MAINTENANCE LABORATORY  L T P C  0 0 3 2

OBJECTIVES:
- To train the structures in identifying the fault and rectification.

STUDY EXPERIMENTS:
1. Tools and instruments required for maintenance
2. Safety aspects with respect to man, machine and tools
3. General procedures for servicing and maintenance schedule
4. Wheel Alignment procedure
LIST OF EXPERIMENTS:
1. Minor and major tune up of gasoline and diesel engines
2. Calibration of Fuel pump
3. Engine fault diagnosis using scan tool
4. Fault diagnosis and service of transmission system
5. Fault diagnosis and service of driveline system
6. Fault diagnosis and service of braking system
7. Fault diagnosis and service of suspension system
8. Fault diagnosis and service of steering system
9. Fault diagnosis and service of Electrical system like battery, starting system, charging system,
   lighting system etc
10. Fault diagnosis and service of vehicle air conditioning system
11. Practice the following:
   i. Adjustment of pedal play in clutch, brake, hand brake lever and steering wheel play.
   ii. Air bleeding from hydraulic brakes, air bleeding of diesel fuel system.
   iii. Wheel bearings tightening and adjustment.
   iv. Adjustment of head lights beam.
   v. Removal and fitting of tire and tube.

TOTAL : 45 PERIODS

OUTCOMES:
• Ability to identify the faults and knowledge on maintenance

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Engine Analyzer</td>
<td>1 No.</td>
</tr>
<tr>
<td>2</td>
<td>Cylinder compression pressure gauge</td>
<td>1 No.</td>
</tr>
<tr>
<td>3</td>
<td>Vacuum gauge</td>
<td>1 No.</td>
</tr>
<tr>
<td>4</td>
<td>Spark plug cleaner and tester</td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td>Cam angle and rpm tester</td>
<td>1 No.</td>
</tr>
<tr>
<td>6</td>
<td>Tachometer</td>
<td>1 No.</td>
</tr>
<tr>
<td>7</td>
<td>Wheel alignment apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>8</td>
<td>Gas welding equipment</td>
<td>1 No.</td>
</tr>
<tr>
<td>9</td>
<td>Tyre remover</td>
<td>1 No.</td>
</tr>
<tr>
<td>10</td>
<td>Bearing puller</td>
<td>1 No.</td>
</tr>
<tr>
<td>11</td>
<td>Head light alignment gauge</td>
<td>1 No.</td>
</tr>
<tr>
<td>12</td>
<td>Service manuals of petrol, diesel engines</td>
<td>1 No: each</td>
</tr>
<tr>
<td>13</td>
<td>Cylinder reboring machine</td>
<td>1 No.</td>
</tr>
<tr>
<td>14</td>
<td>Valve grinding machine</td>
<td>1 No.</td>
</tr>
<tr>
<td>15</td>
<td>Valve lapping machine</td>
<td>1 No.</td>
</tr>
<tr>
<td>16</td>
<td>Fuel injection calibration test bench with nozzle tester</td>
<td>1 No.</td>
</tr>
<tr>
<td>17</td>
<td>HRD tester, Clamp on meter, Hydrometer</td>
<td>1 No: each</td>
</tr>
</tbody>
</table>
OBJECTIVES:

- The main objective of this course is to impart knowledge in the construction of vehicle, aerodynamic, concept, paneling of passenger car body trim. At the end of the course the student will be well versed in the design and construction of external body of the vehicles.

UNIT I CAR BODY DETAILS 10
Types of Car body - Saloon, convertibles, Limousine, Estate Van, Racing and Sports car – Visibility regulations, driver’s visibility, improvement in visibility and tests for visibility. Driver seat design - Car body construction-Various panels in car bodies. Safety aspect of car body.

UNIT II BUS BODY DETAILS 9
Types of bus body: based on capacity, distance traveled and based on construction.– Bus body lay out for various types, Types of metal sections used – Regulations – Constructional details: Conventional and integral. driver seat design- Safety aspect of bus body.

UNIT III COMMERCIAL VEHICLE DETAILS 8
Types of commercial vehicle bodies - Light commercial vehicle body. Construction details of commercial vehicle body - Flat platform body, Trailer, Tipper body and Tanker body – Dimensions of driver’s seat in relation to controls – Drivers cab design - Regulations.

UNIT IV VEHICLE AERODYNAMICS 9
Objectives, Vehicle drag and types. Various types of forces and moments. Effects of forces and moments. Side wind effects on forces and moments. Various body optimization techniques for minimum drag. Wind tunnels – Principle of operation, Types. Wind tunnel testing such as: Flow visualization techniques, Airflow management test – measurement of various forces and moments by using wind tunnel.

UNIT V BODY MATERIALS, TRIM, MECHANISMS AND BODY REPAIR 9

TOTAL : 45 PERIODS

OUTCOMES

Upon completion of the course, students will
- Know about different aspects of car body and bus body, types, commercial vehicle.
- Role of various aerodynamic forces and moments, measuring instruments
- Know about the material used in body building, tools used, body repairs.

TEXT BOOKS:

REFERENCES:
AT6811 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.

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.

GE6075 PROFESSIONAL ETHICS IN ENGINEERING

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

UNIT II ENGINEERING ETHICS

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS
UNIT V  GLOBAL ISSUES
TOTAL: 45 PERIODS

OUTCOMES:
• 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

TEXT BOOKS:

REFERENCES:

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

AT6001  AUTOMOTIVE AIR-CONDITIONING  L T P C
3 0 0 3

OBJECTIVES
• At the end of the course, the students will be able to understand the components of the automotive air-conditioning and their functions and the latest developments in this field.

UNIT I  AUTOMOTIVE AIRCONDITIONING FUNDAMENTALS
Purposes of Heating, Ventilation and Air Conditioning- Environmental Concerns- Ozone layer depletion- Location of air conditioning components in a car – Schematic layout of a vehicle refrigeration system. Psychrometry – Basic terminology and Psychrometric mixtures- Psychrometric Chart- Related problems

UNIT II  AUTOMOTIVE COOLING AND HEATING SYSTEM
Vehicle Refrigeration System and related problems- Fixed thermostatic and Orifice tube system- Variable displacement thermostatic and Orifice tube system- Vehicle air conditioning operation
Types of compressor- Compressor Clutches- Compressor Clutch electrical circuit- Compressor lubrication- Condensers- Evaporators- Expansion devices- Evaporator temperature and pressure controls- receiver-drier- Accumulators- refrigerant hoses, Connections and other assemblies- Heating system

UNIT III AIR-CONDITIONING CONTROLS, DELIVERY SYSTEM AND REFRIGERANTS 9
Types of Control devices- Preventing Compressor damage- Preventing damage to other systems- Maintaining driveability- Preventing Overheating
Ram air ventilation- Air delivery Components- Control devices- Vacuum Controls
Containers – Handling refrigerants – Discharging, Charging & Leak detection – Refrigeration system diagnosis – Diagnostic procedure – Ambient conditions affecting system pressures.

UNIT IV AUTOMATIC TEMPERATURE CONTROL 9
Different types of sensors and actuators used in automatic temperature control- Fixed and variable displacement temperature control- Semi Automatic- Controller design for Fixed and variable displacement type air conditioning system

UNIT V SYSTEM SERVICING AND TESTING 9
Special tools for servicing vehicle air conditioning – Diagnosing components and air conditioning systems- Diagnosing cooling system- Air delivery system- Automatic temperature Control system diagnosis and service

TOTAL : 45 PERIODS

OUTCOMES
• Upon the completion of the course, the student should understand the basic of vehicle air-conditioning system, its components, working principle, control mechanism, service etc.

TEXT BOOKS:

REFERENCES:

AT6002 ALTERNATIVE FUELS AND ENERGY SYSTEMS

OBJECTIVES:
• To know about the types of alternative fuels and energy sources for IC engines.

UNIT I ALCOHOLS AS FUELS 9
Introduction to alternative fuels. - Need for alternative fuels - Availability of different alternative fuels for SI and CI engines. Alcohols as fuels. Production methods of alcohols. Properties of alcohols as

UNIT II    VEGETABLE OILS AS FUELS  9

UNIT III   HYDROGEN AS ENGINE FUEL  9

UNIT IV    BIOGAS, NATURAL GAS AND LPG AS FUELS  9
Production methods of Biogas, Natural gas and LPG. Properties studies. CO₂ and H₂S scrubbing in Biogas., Modification required to use in SI and CI Engines- Performance and emission characteristics of Biogas, NG and LPG in SI and CI engines.

UNIT V    ELECTRIC, HYBRID AND FUEL CELL VEHICLES  9

TOTAL: 45 PERIODS

OUTCOMES:
- On completion of the course, the student will understand the various alternative fuels available, its properties, performance characteristics, combustion characteristics, emission characteristics, engine modifications required etc.,

TEXT BOOK:

REFERENCES:
3. Transactions of SAE on Biofuels (Alcohols, vegetable oils, CNG, LPG, Hydrogen, Biogas etc.).
OBJECTIVES:

- knowledge in basic of vibration and noise
- Understanding the effect of noise an human comfort and environment
- Knowing the methods of vibration and noise measurement.

UNIT I   FUNDAMENTALS OF ACOUSTICS AND NOISE, VIBRATION   8

UNIT II   EFFECTS OF NOISE, BLAST, VIBRATION, AND SHOCK ON PEOPLE   7

UNIT III   TRANSPORTATION NOISE AND VIBRATION—SOURCES, PREDICTION, AND CONTROL   10

UNIT IV   INTERIOR TRANSPORTATION NOISE AND VIBRATION SOURCES - PREDICTION AND CONTROL   10
Introduction to Interior Transportation Noise and Vibration Sources, Automobile, Bus, and Truck Interior Noise and Vibration Prediction and Control, Noise and Vibration in Off-Road Vehicle Interiors- Prediction and Control,

UNIT V   NOISE AND VIBRATION TRANSDUCERS, ANALYSIS EQUIPMENT, SIGNAL PROCESSING, AND MEASURING TECHNIQUES   10

TOTAL : 45 PERIODS

OUTCOMES:

- At the end of the course, the student will understand the sources, effects, prediction, control techniques, measurement techniques of noise, vibration pertain to an automobile.

TEXT BOOKS:


REFERENCES:

AT6004 ADVANCE THEORY OF IC ENGINES

OBJECTIVES:
- Knowledge in usage of software for simulating the performance of IC engines
- Acquiring ability to simulate the various types combustion processes of IC engines.
- Knowledge in performance simulation of IC engines.

UNIT I COMBUSTION OF FUELS

UNIT II ENGINE CYCLE ANALYSIS
Ideal air, fuel air cycle and actual cycle analysis. Progressive combustion analysis in SI engines. Parametric studies on work output, efficiency and other engine performance.

UNIT III COMBUSTION MODELLING

UNIT IV NON-CONVENTIONAL IC ENGINES

UNIT V COMBUSTION ANALYSIS IN IC ENGINES
Photographic studies of combustion processes – Analysis of Pressure crank angle diagrams in SI and CI engines. Knock study for Pressure crank angle histories. Apparent heat release rate and Wiebe’s law analysis for combustion. Calculation of Ignition delay and combustion duration. – Hot wire and laser Doppler anemometry and velocimetry for flow and combustion analysis in IC engines.

OUTCOMES:
- At the end of the course, the student can able to model and simulate the engine cycle, perform combustion analysis, instruments used in measurement, recent developments in the IC engines.
TEXT BOOKS:

REFERENCES:

AT6005 METROLOGY AND INSTRUMENTATION

OBJECTIVES:
- Knowledge in usage of software to measure parameters like speed, position, velocity, pressure, force, torque, temperature etc

UNIT I INTRODUCTION TO MEASUREMENTS AND SENSORS

UNIT II VARIABLE RESISTANCE AND INDUCTANCE SENSORS
Principle of operation- Construction details- Characteristics and applications of resistive potentiometer- Strain gauges- Resistive thermometers- Thermistors- Piezoresistive sensors Inductive potentiometer- Variable reluctance transducers:- EI pick up and LVDT

UNIT III VARIABLE AND OTHER SPECIAL SENSORS
Variable air gap type, variable area type and variable permittivity type- capacitor microphone Piezoelectric, Magnetostrictive, Hall Effect, semiconductor sensor- digital transducers-Humidity Sensor. Rain sensor, climatic condition sensor, solar, light sensor, antiglare sensor.

UNIT IV AUTOMOTIVE PRESSURE AND FORCE/TORQUE SENSOR
Pressure Sensor:
Typical automotive applications- Thick film pressure sensor- Semiconductor pressure sensor- Integrated silicon intake-manifold pressure sensor-Integrated silicon combustion-pressure sensor- Piezo electric sensor-High pressure sensor with metal diaphragm.

Force/Torque Sensor:
Typical automotive applications- Magneto elastic bearing-pin sensor- Magneto elastic tension/compressive-force sensor according to the cross-ductor principle – Basic principle of torque measurement – Stress and Angle measuring torque sensor

80
UNIT V  AUTOMOTIVE POSITION AND RPM/VELOCITY SENSORS


Temperature Sensors: - Typical automotive applications - Sintered-Ceramic resistors - Thin film resistors - Thick film resistors - Monocrystalline silicon semiconductor resistor - Thermopile sensors


Introduction to MEMs

OUTCOMES:
• At the end of the course, the students will aware the various instruments that are available to measure parameters like speed, position, velocity, pressure, force, torque, temperature etc.

TEXT BOOKS:

REFERENCES:

AT6006 MANUFACTURING OF AUTOMOTIVE COMPONENTS

OBJECTIVES:
• To impart knowledge on basic principle and production methods of automotive components.

UNIT I  CASTED ENGINE COMPONENTS
Material selection and Manufacturing methods for Piston, Piston rings, Cylinder block, wet and dry liners, Engine head, Oil pan, Carburetors. Thermal barrier coating of Engine head and valves.

UNIT II  FORGED ENGINE COMPONENTS
Material selection and Manufacturing methods for Crank shaft, Connecting rod, Cam shaft, valve, Piston pin, Push rod, Rocker arm, tappets, spark plug.

UNIT III  TRANSMISSION SYSTEM
UNIT IV VEHICLE CHASSIS

UNIT V RECENT DEVELOPMENTS

OUTCOMES
- Upon completion of this course the student can able to use the basic principle and production methods of automotive components

TEXT BOOK:

REFERENCES:
2. Newton and steels, the motor vehicle, ELBS, 1990

ME6006 DESIGN OF JIGS, FIXTURES AND PRESSTOOLS

OBJECTIVES:
- To understand the functions and design principles of Jigs, fixtures and press tools
- To gain proficiency in the development of required views of the final design.

UNIT I LOCATING AND CLAMPING PRINCIPLES:

UNIT II JIGS AND FIXTURES
Design and development of jigs and fixtures for given component- Types of Jigs – Post, Turnover, Channel, latch, box, pot, angular post jigs – Indexing jigs – General principles of milling, Lathe, boring, broaching and grinding fixtures – Assembly, Inspection and Welding fixtures – Modular fixturing systems- Quick change fixtures.

UNIT III PRESS WORKING TERMINOLOGIES AND ELEMENTS OF CUTTING DIES
UNIT IV BENDING AND DRAWING DIES

UNIT V OTHER FORMING TECHNIQUES
Bulging, Swaging, Embossing, coining, curling, hole flanging, shaving and sizing, assembly, fine Blanking dies – recent trends in tool design- computer Aids for sheet metal forming Analysis – basic introduction - tooling for numerically controlled machines- setup reduction for work holding – Single minute exchange of dies – Poka Yoke.

TOTAL: 45 PERIODS

Note: (Use of P S G Design Data Book is permitted in the University examination)

OUTCOMES:
• Upon completion of this course, the students can able to design jigs, fixtures and press tools.

TEXT BOOKS:

REFERENCES:
5. ASTME Fundamentals of Tool Design Prentice Hall of India.

ME6010 ROBOTICS

OBJECTIVES:
• To understand the functions of the basic components of a Robot.
• To study the use of various types of End of Effectors and Sensors
• To impart knowledge in Robot Kinematics and Programming
• To learn Robot safety issues and economics.

UNIT I FUNDAMENTALS OF ROBOT
Robot - Definition - Robot Anatomy - Co ordinate Systems, Work Envelope Types and Classification Specifications-Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load- Robot Parts and their Functions-Need for Robots-Different Applications.

UNIT II ROBOT DRIVE SYSTEMS AND END EFFECTORS
Pneumatic Drives-Hydraulic Drives-Mechanical Drives-Electrical Drives-D.C. Servo Motors, Stepper Motors, A.C. Servo Motors-Salient Features, Applications and Comparison of all these Drives, End
Effectors-Grippers-Mechanical Grippers, Pneumatic and Hydraulic- Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations.

UNIT III SENSORS AND MACHINE VISION


UNIT IV ROBOT KINEMATICS AND ROBOT PROGRAMMING

Forward Kinematics, Inverse Kinematics and Difference; Forward Kinematics and Reverse Kinematics of manipulators with Two, Three Degrees of Freedom (in 2 Dimension), Four Degrees of freedom (in 3 Dimension) Jacobians, Velocity and Forces-Manipulator Dynamics, Trajectory Generator, Manipulator Mechanism Design-Derivations and problems. Lead through Programming, Robot programming Languages-VAL Programming-Motion Commands, Sensor Commands, End Effector commands and simple Programs.

UNIT V IMPLEMENTATION AND ROBOT ECONOMICS

RGV, AGV; Implementation of Robots in Industries-Various Steps; Safety Considerations for Robot Operations - Economic Analysis of Robots.

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to apply the basic engineering knowledge for the design of robotics

TEXT BOOKS:

REFERENCES:
AT6007 NEW GENERATION AND HYBRID VEHICLES

OBJECTIVES:

- To illustrate the new generation vehicles and their operation and controls

UNIT I INTRODUCTION

Electric and hybrid vehicles, flexible fuel vehicles (FFV), solar powered vehicles, magnetic track vehicles, fuel cells vehicles.

UNIT II POWER SYSTRM AND NEW GENERATION VEHICLES

Hybrid Vehicle engines, Stratified charge engines, learn burn engines, low heat rejection engines, hydrogen engines, HCCI engine, VCR engine, surface ignition engines, VVTI engines. High energy and power density batteries, fuel cells, solar panels, flexible fuel systems.

UNIT III VEHICLE OPERATION AND CONTROL

Computer Control for pollution and noise control and for fuel economy – Transducers and actuators - Information technology for receiving proper information and operation of the vehicle like optimum speed and direction.

UNIT IV VEHICLE AUTOMATED TRACKS

Preparation and maintenance of proper road network - National highway network with automated roads and vehicles - Satellite control of vehicle operation for safe and fast travel, GPS.

UNIT V SUSPENSION, BRAKES, AERODYNAMICS AND SAFETY

Air suspension – Closed loop suspension, compensated suspension, anti skid braking system, retarders, regenerative braking, safety gauge air backs- crash resistance. Aerodynamics for modern vehicles, safety systems, materials and standards.

OUTCOMES:

- Upon completion of this course the student will familiar in the recent development pertain to energy system, vehicle operation, newer vehicle, recent technologies in the area of suspension systems, brakes, aerodynamics etc

TEXT BOOKS:


REFERENCES

1. Light weight electric for hybrid vehicle design.
2. Advance hybrid vehicle power transmission, SAE.

AT6008 COMPUTER SIMULATION OF IC ENGINES

OBJECTIVES:

- To impart knowledge in simulating IC engine processes. The detailed concept of air standard, fuel air cycle, progressive and actual cycle simulation of SI engine will be taught to the students. At the end of the course the students will have command over simulation of IC engine process.
UNIT I  INTRODUCTION

UNIT II  COMBUSTION AND STOICHIOMETRY
Reactive processes, Heat of reaction, measurement of URP, measurement of HRP. Introduction - combustion equation for hydrocarbon fuels. Calculation of minimum air required for combustion, excess air supplied and stoichiometric air required for complete combustion. Conversion of volumetric analysis to mass analysis.

UNIT III  ADIABATIC FLAME TEMPERATURE
Introduction, complete combustion in C-H-N-O systems, constant volume adiabatic combustion, constant pressure adiabatic combustion, calculation of adiabatic flame temperature, isentropic changes of state. SI Engine simulation with air as working medium, deviation between actual and ideal cycle.

UNIT IV  SI ENGINE SIMULATION WITH ADIABATIC COMBUSTION
Introduction, Engine details, temperature drop due to fuel vaporization, full throttle operation, work output and efficiency calculation, part-throttle operation, engine performance at part throttle, super charged operation, SI Engines simulation with progressive combustion. Wiebe’s law combustion analysis.

UNIT V  SI ENGINE SIMULATION WITH GAS EXCHANGE PROCESS
Introduction, gas exchange process, Heat transfer process, friction calculations, compression of simulated values, validation of the computer code, engine performance simulation, pressure crank angle diagram, brake power, brake thermal efficiency, effect of speed on performance.

TOTAL : 45 PERIODS

OUTCOMES:
• The student will be familiar with the basics of simulation, combustion process, SI Engine modeling and simulation process

TEXTBOOKS:

REFERENCES:
OBJECTIVES:

- To understand the fundamentals of composite material strength and its mechanical behavior
- Understanding the analysis of fiber reinforced Laminate design for different combinations of plies with different orientations of the fiber.
- Thermo-mechanical behavior and study of residual stresses in Laminates during processing.
- Implementation of Classical Laminate Theory (CLT) to study and analysis for residual stresses in an isotropic layered structure such as electronic chips.

UNIT I  INTRODUCTION, LAMINA CONSTITUTIVE EQUATIONS & MANUFACTURING  12

UNIT II  FLAT PLATE LAMINATE CONSTITUTE EQUATIONS  10

UNIT III  LAMINA STRENGTH ANALYSIS  5

UNIT IV  THERMAL ANALYSIS  8

UNIT V  ANALYSIS OF LAMINATED FLAT PLATES  10

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to analyse the fiber reinforced Laminate for optimum design
- Apply classical laminate theory to study and analyse the residual stresses in Laminate.

TEXT BOOKS:
REFERENCES:

AT6009 AUTOMOTIVE AERODYNAMICS

OBJECTIVES:
• At the end of the course, the students will be able to apply basic principles of aerodynamics for the design of vehicle body.

UNIT I INTRODUCTION
Scope, historical developments, fundamental of fluid mechanics, flow phenomenon related to vehicles, external and internal flow problem, resistance to vehicle motion, performance, fuel consumption and performance potential of vehicle aerodynamics.

UNIT II AERODYNAMIC DRAG OF CARS
Cars as a bluff body, flow field around car, drag force, types of drag force, analysis of aerodynamic drag, drag coefficient of cars, strategies for aerodynamic development, low drag profiles.

UNIT III SHAPE OPTIMIZATION OF CARS
Front end modification, front and rear wind shield angle, boat tailing, hatch back, fast back and square back, dust flow patterns at the rear, effects of gap configuration, effect of fasteners. Case studies on modern vehicles.

UNIT IV VEHICLE HANDLING
The origin of forces and moments on a vehicle, lateral stability problems, methods to calculate forces and moments – vehicle dynamics under side winds, the effects of forces and moments, characteristics of forces and moments, dirt accumulation on the vehicle, wind noise, drag reduction in commercial vehicles and racing cars.

UNIT V WIND TUNNELS FOR AUTOMOTIVE AERODYNAMICS
Introduction, principle of wind tunnel technology, limitation of simulation, stress with scale models, full scale wind tunnels, measurement techniques, equipment and transducers, road testing methods, numerical methods. CFD analysis.

TOTAL : 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students will understand the fundamentals of aerodynamics, vehicle body optimisation, measuring aerodynamics forces etc.

TEXT BOOK:
REFERENCES:

AT6010 OFF ROAD VEHICLES

OBJECTIVES:
• At the end of the course, the students will be able to understand the various Off road vehicle and their systems and features

UNIT I CLASSIFICATION AND REQUIREMENTS OF OFF ROAD VEHICLES
Construction layout, capacity and applications. Power Plants, Chassis and Transmission, Multiaxle vehicles.

UNIT II EARTH MOVING MACHINES
Earthmovers like dumpers, loaders - single bucket, Multi bucket and rotary types - bulldozers, excavators, backhoe loaders, scrappers, drag and self powered types, Bush cutters, stumpers, tree dozer, rippers etc. – Power and capacity of earth moving machines.

UNITY III SCRAPPERS, GRADERS, SHOVELS AND DITCHERS

UNIT IV FARM EQUIPMENTS, MILITARY AND COMBAT VEHICLES
Power take off, special implements. Special features and constructional details of tankers, gun carriers and transport vehicles.

UNIT V VEHICLE SYSTEMS, FEATURES

TOTAL: 45 PERIODS

OUTCOMES:
• At the end of the course, the students will understand the types, special features, design methodology, working principle, application of various off – road vehicles.

TEXT BOOKS:

REFERENCES:

AT6011 AUTOMOTIVE SAFETY L T P C
3 0 0 3

OBJECTIVES:
• At the end, the students will have good exposure to automotive safety aspects including the understanding of the various safety equipments.

UNIT I INTRODUCTION
9
Design of the body for safety, energy equation, engine location, deceleration of vehicle inside passenger compartment, deceleration on impact with stationary and movable obstacle, concept of crumble zone, safety sandwich construction.

UNIT II SAFETY CONCEPTS
9
Active safety: driving safety, conditional safety, perceptibility safety, operating safety, passive safety: exterior safety, interior safety, deformation behaviour of vehicle body, speed and acceleration characteristics of passenger compartment on impact.

UNIT III SAFETY EQUIPMENTS
9
Seat belt, regulations, automatic seat belt tightener system, collapsible steering column, tiltable steering wheel, air bags, electronic system for activating air bags, bumper design for safety.

UNIT IV COLLISION WARNING AND AVOIDANCE
9
Collision warning system, causes of rear end collision, frontal object detection, rear vehicle object detection system, object detection system with braking system interactions.

UNIT V COMFORT AND CONVENIENCE SYSTEM
9
Steering and mirror adjustment, central locking system, Garage door opening system, tyre pressure control system, rain sensor system, environment information system

TOTAL: 45 PERIODS

OUTCOMES:
• The student will be familiar in various systems that enhances vehicle safety, passenger comfort, recent technologies in automobile field etc.,

TEXT BOOKS

REFERENCES:
AT6012 ENGINE AUXILIARY SYSTEMS

OBJECTIVES:
• To make the students understand the various auxiliary systems used in automobiles and their functions.

UNIT I CARBURETION
Properties of air-petrol mixtures, Air fuel ratio requirements or SI Engines working of a simple fixed venturi and constant vacuum carburetor, design of elementary carburetor, Chokes, Effects of altitude on carburetion, Carburetor for 2–stroke and 4-stroke engines, carburetor systems for emission control.

UNIT II GASOLINE INJECTION AND IGNITION SYSTEMS

UNIT III DIESEL FUEL INJECTION
Factors influencing fuel spray atomization, penetration and dispersion of diesel and heavy oils and their properties, rate and duration of injection, fuel line hydraulics, fuel pump, injectors, CRDI systems and its merits and demerits.

UNIT IV MANIFOLDS AND MIXTURE DISTRIBUTION
Intake system components, Discharge coefficient, Pressure drop, Air filter, Intake manifold, Connecting pipe, Exhaust system components, Exhaust manifold and exhaust pipe, Spark arresters, Waste heat recovery, Exhaust mufflers, Type of mufflers, exhaust manifold expansion.

UNIT V LUBRICATION AND COOLING SYSTEMS
Lubricants, lubricating systems, Lubrication of piston rings, bearings, oil consumption, Oil cooling. Heat transfer coefficients, liquid and air cooled engines, coolants, additives and lubricity improvers, concept of adiabatic engines.

TOTAL: 45 PERIODS

OUTCOMES:
• At the end of the course, the student will be familiar with the auxiliary system, its roles, functionality, construction, working principle etc.

TEXT BOOKS:
1. Ramalingam, K.K, "Internal Combustion Engine", Scitech Publication (India)

REFERENCES:
OBJECTIVES:
• The students are able to manage a transport fleet and their related activities for minimizing operational cost.

UNIT I INTRODUCTION
Personnel management; objectives and functions of personnel management, psychology, sociology and their relevance to organization, personality problems. Selection process: job description, employment tests, interviewing, introduction to training objectives, advantages, methods of training, training procedure, psychological tests.

UNIT II TRANSPORT SYSTEMS
Introduction to various transport systems. Advantages of motor transport. Principal function of administrative, traffic, secretarial and engineering divisions. chain of responsibility, forms of ownership by state, municipality, public body and private undertakings.

UNIT III SCHEDULING AND FARE STRUCTURE
Principal features of operating costs for transport vehicles with examples of estimating the costs. Fare structure and method of drawing up of a fare table. Various types of fare collecting methods. Basic factors of bus scheduling. Problems on bus scheduling.

UNIT IV MOTOR VEHICLE ACT
Traffic signs, fitness certificate, registration requirements, permit insurance, constructional regulations, description of vehicle-tankers, tippers, delivery vans, recovery vans, Power wagons and fire fighting vehicles. Spread over, running time, test for competence to drive.

UNIT V MAINTENANCE
Preventive maintenance system in transport industry, tyre maintenance procedures. Causes for uneven tyre wear; remedies, maintenance procedure for better fuel economy, Design of bus depot layout.

OUTCOMES:
Upon completion of the course, students will
• Know about different aspects related to transport system and management.
• Features of scheduling, fixing the fares
• Know about the motor vehicle act and maintenance aspects of transport.

TEXT BOOKS:

REFERENCES:
1. Government Motor Vehicle Act, Publication on latest act to be used as on date
OBJECTIVES:
• To develop and strengthen entrepreneurial quality and motivation in students and to impart basic entrepreneurial skills and understanding to run a business efficiently and effectively.

UNIT I ENTREPRENEURSHIP

UNIT II MOTIVATION
Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.

UNIT III BUSINESS

UNIT IV FINANCING AND ACCOUNTING

UNIT V SUPPORT TO ENTREPRENEURS

OUTCOMES:
• Upon completion of the course, students will be able to gain knowledge and skills needed to run a business successfully.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To provide knowledge and training in using optimization techniques under limited resources for the engineering and business problems.

UNIT I  LINEAR MODELS  15

UNIT II  TRANSPORTATION MODELS AND NETWORK MODELS  8

UNIT III  INVENTORY MODELS  6
Inventory models – Economic order quantity models – Quantity discount models – Stochastic inventory models – Multi product models – Inventory control models in practice.

UNIT IV  QUEUEING MODELS  6
Queueing models - Queueing systems and structures – Notation parameter – Single server and multi server models – Poisson input – Exponential service – Constant rate service – Infinite population – Simulation.

UNIT V  DECISION MODELS  10

OUTCOMES:
- Upon completion of this course, the students can use the optimization techniques for engineering and business problems

TEXT BOOK:

REFERENCES:
OBJECTIVES:

To facilitate the understanding of Quality Management principles and process.

UNIT I INTRODUCTION

UNIT II TQM PRINCIPLES
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
The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT IV TQM TOOLS AND TECHNIQUES II

UNIT V QUALITY SYSTEMS

OUTCOMES:

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

TEXT BOOK:

REFERENCES:
ANNA UNIVERSITY, CHENNAI  
AFFILIATED INSTITUTIONS  
R-2013  
B.E. ELECTRONICS AND COMMUNICATION ENGINEERING  
I – VIII SEMESTERS CURRICULUM AND SYLLABUS  

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### SEMESTER VII

#### ELECTIVE – II

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### SEMESTER VIII

#### ELECTIVE – V

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#### ELECTIVE – VI

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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
9+3
Listening - Introducing learners to GIE - Types of listening - Listening to audio (verbal & sounds); 
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 - 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
9+3
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
9+3
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
9+3
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

- Project
- Assignment
- Reviews
- Creative writing
- Poster making, etc.

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

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

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.

TEXT BOOKS:

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

UNIT I  CRYSTAL PHYSICS
Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, 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
Elasticity- Hooke’s law - Relationship between three moduli 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

UNIT III  QUANTUM PHYSICS

UNIT IV  ACOUSTICS AND ULTRASONICS
Production of ultrasonics 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.

TOTAL: 45 PERIODS

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
TEXT BOOKS:

REFERENCES:
1. Searls and Zemansky. University Physics, 2009

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
9
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 polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension. Preparation, properties and uses of Nylon 6,6, and Epoxy resin.

UNIT II CHEMICAL THERMODYNAMICS
9
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 isochore (problems).

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY
9
UNIT IV PHASE RULE AND ALLOYS


UNIT V NANOCHEMISTRY

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, electrodeposition, chemical vapour deposition, laser ablation; Properties and applications

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.

TEXT BOOKS:

REFERENCES:

GE6151 COMPUTER PROGRAMMING

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.

TOTAL: 45 PERIODS

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:

GE6152  ENGINEERING GRAPHICS  L T P C
2 0 3 4

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 5+9
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 5+ 9
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 5+9
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 5+9
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 6+9
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) 3
Introduction to drafting packages and demonstration of their use.

TOTAL: 75 PERIODS

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.
TEXT BOOK:

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:
1. Search, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions – Includes Parameter Passing
9. Program using Recursive Function and conversion from given program to flow chart.
10. 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 EQUIPMENT 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 9

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.
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.

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

REFERENCES:

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
LIST OF EXPERIMENTS
(Any FIVE Experiments)

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.

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)
6. Determination of molecular weight of polyvinylalcohol using Ostwald viscometer
7. Conductometric titration of strong acid vs strong base

TOTAL: 30 PERIODS

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

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, porcelain tile, dropper (each 30 Nos.)

REFERENCES:
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
9+3
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
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%

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 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 9+3
Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green’s theorem in a plane, Gauss divergence theorem and Stokes’ theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.

UNIT II ORDINARY DIFFERENTIAL EQUATIONS 9+3
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 9+3

UNIT IV ANALYTIC FUNCTIONS 9+3
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 9+3
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.

TEXT BOOKS:

REFERENCES:
PH6251 ENGINEERING PHYSICS – II

L T P C
3 0 0 3

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
- 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

UNIT V  ADVANCED ENGINEERING MATERIALS

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

TEXT BOOKS:

REFERENCES:
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

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

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.

REFERENCES:

EC6201 ELECTRONIC DEVICES

OBJECTIVES:
The student should be made to:
- Be exposed to basic electronic devices
- Be familiar with the theory, construction, and operation of Basic electronic devices.

UNIT I SEMICONDUCTOR DIODE
PN junction diode, Current equations, Diffusion and drift current densities, forward and reverse bias characteristics, Switching Characteristics.

UNIT II BIPOLAR JUNCTION

UNIT III FIELD EFFECT TRANSISTORS
JFETs – Drain and Transfer characteristics,-Current equations-Pinch off voltage and its significance-MOSFET- Characteristics- Threshold voltage -Channel length modulation, D-MOSFET, E-MOSFET- ,Current equation - Equivalent circuit model and its parameters, FINFET,DUAL GATE MOSFET.

UNIT IV SPECIAL SEMICONDUCTOR DEVICES
Metal-Semiconductor Junction- MESFET, Schottky barrier diode-Zener diode-Varactor diode –Tunnel diode- Gallium Arsenide device, LASER diode, LDR.

UNIT V POWER DEVICES AND DISPLAY DEVICES
OUTCOMES:
At the end of the course, the student should be able to:
  • Explain the theory, construction, and operation of basic electronic devices.
  • Use the basic electronic devices

TEXT BOOKS

REFERENCES:

EE6201 CIRCUIT THEORY

OBJECTIVES:
  • To introduce electric circuits and its analysis
  • To impart knowledge on solving circuits using network theorems
  • To introduce the phenomenon of resonance in coupled circuits.
  • To educate on obtaining the transient response of circuits.
  • To Phasor diagrams and analysis of three phase circuits

UNIT I BASIC CIRCUITS ANALYSIS

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

UNIT III RESONANCE AND COUPLED CIRCUITS

UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS
Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input – Characterization of two port networks in terms of Z,Y and h parameters.

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

**TOTAL: 60 PERIODS**

**OUTCOMES:**
- Ability analyse electrical circuits
- Ability to apply circuit theorems
- Ability to analyse AC and DC Circuits

**TEXT BOOKS:**

**REFERENCES:**

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**GE6262**

**PHYSICS AND CHEMISTRY LABORATORY – II**

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<td>1</td>
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</tbody>
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**PHYSICS LABORATORY – II**

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

(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
(Any FIVE Experiments)

OBJECTIVES:
To make the student acquire practical skills in the wet chemical and instrumental methods for quantitive estimation of hardness, alkalinity, metal ion content, corrosion in metals and cement analysis.
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)
OBJECTIVES:
The student should be made to:

- Be exposed to the characteristics of basic electronic devices
- Be exposed to RL and RC circuits
- Be familiar with Thevinin & Norton theorem KVL & KCL, and Super Position Theorems

LIST OF EXPERIMENTS:
1. Characteristics of PN Junction Diode
2. Zener diode Characteristics & Regulator using Zener diode
3. Common Emitter input-output Characteristics
4. Common Base input-output Characteristics
5. FET Characteristics
6. SCR Characteristics
7. Clipper and Clumper & FWR
8. Verifications Of Thevinin & Norton theorem
9. Verifications Of KVL & KCL
10. Verifications Of Super Position Theorem
11. verifications of maximum power transfer & reciprocity theorem
12. Determination Of Resonance Frequency of Series & Parallel RLC Circuits
13. Transient analysis of RL and RC circuits

TOTAL: 45 PERIODS

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

- Learn the characteristics of basic electronic devices
- Design RL and RC circuits
- Verify Thevinin & Norton theorem KVL & KCL, and Super Position Theorems

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>BC 107, BC 148, 2N2646, BFW10</td>
<td>25 each</td>
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<tr>
<td>1N4007, Zener diodes</td>
<td>25 each</td>
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<tr>
<td>Resistors, Capacitors, Inductors</td>
<td>sufficient quantities</td>
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<tr>
<td>Bread Boards</td>
<td>15 Nos</td>
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<tr>
<td>CRO (30MHz)</td>
<td>10 Nos.</td>
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<tr>
<td>Function Generators (3MHz)</td>
<td>10 Nos.</td>
</tr>
<tr>
<td>Dual Regulated Power Supplies (0 – 30V)</td>
<td>10 Nos.</td>
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MA6351 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

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
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

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS
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

UNIT V Z-TRANSFORMS AND DIFFERENCE EQUATIONS

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

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:
UNIT I DC MACHINES

UNIT II TRANSFORMER

UNIT III INDUCTION MACHINES AND SYNCHRONOUS MACHINES

UNIT IV BASICS OF MEASUREMENT AND INSTRUMENTATION

UNIT V ANALOG AND DIGITAL INSTRUMENTS

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

OUTCOMES:
Students will be able to understand
• The three phase supply and power measurement.
- The concepts in electrical generators, motors and transformers.
- The basic measurement and instrumentation based devices.
- The relevance of digital instruments in measurements.
TEXT BOOKS:

REFERENCES:

EC6301 OBJECT ORIENTED PROGRAMMING AND DATA STRUCTURES L T P C 3 0 0 3

OBJECTIVES:
• To comprehend the fundamentals of object oriented programming, particularly in C++.
• To use object oriented programming to implement data structures.
• To introduce linear, non-linear data structures and their applications.

UNIT I DATA ABSTRACTION & OVERLOADING 9

UNIT II INHERITANCE & POLYMORPHISM 9
Base Classes and Derived Classes – Protected Members – Casting Class pointers and Member Functions – Overriding – Public, Protected and Private Inheritance – Constructors and Destructors in derived Classes – Implicit Derived – Class Object To Base – Class Object Conversion – Composition Vs. Inheritance – Virtual functions – This Pointer – Abstract Base Classes and Concrete Classes – Virtual Destructors – Dynamic Binding.

UNIT III LINEAR DATA STRUCTURES 10
Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation — singly linked lists – Polynomial Manipulation - Stack ADT – Queue ADT - Evaluating arithmetic expressions

UNIT IV NON-LINEAR DATA STRUCTURES 9
OUTCOMES:
Upon completion of the course, students will be able to:
- Explain the concepts of Object oriented programming.
- Write simple applications using C++.
- Discuss the different methods of organizing large amount of data.

TEXT BOOKS:

REFERENCES:

EC6302 DIGITAL ELECTRONICS

OBJECTIVES:
- To introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions
- To introduce the methods for simplifying Boolean expressions
- To outline the formal procedures for the analysis and design of combinational circuits
- and sequential circuits
- To introduce the concept of memories and programmable logic devices.
- To illustrate the concept of synchronous and asynchronous sequential circuits

UNIT I MINIMIZATION TECHNIQUES AND LOGIC GATES


Logic Gates: AND, OR, NOT, NAND, NOR, Exclusive–OR and Exclusive–NOR Implementations of Logic Functions using gates, NAND–NOR implementations – Multi
level gate implementations- Multi output gate implementations. TTL and CMOS Logic and their characteristics – Tristate gates

UNIT II COMBINATIONAL CIRCUITS


UNIT III SEQUENTIAL CIRCUITS


UNIT IV MEMORY DEVICES


UNIT V SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS

Synchronous Sequential Circuits: General Model – Classification – Design – Use of Algorithmic State Machine – Analysis of Synchronous Sequential Circuits


TOTAL: 45 PERIODS

OUTCOMES:

Students will be able to:

- Analyze different methods used for simplification of Boolean expressions.
- Design and implement Combinational circuits.
- Design and implement synchronous and asynchronous sequential circuits.
- Write simple HDL codes for the circuits.

TEXT BOOK:


REFERENCES:


EC6303 SIGNALS AND SYSTEMS

OBJECTIVES:
- To understand the basic properties of signal & systems and the various methods of classification
- To learn Laplace Transform & Fourier transform and their properties
- To know Z transform & DTFT and their properties
- To characterize LTI systems in the Time domain and various Transform domains

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS
Continuous time signals (CT signals) - Discrete time signals (DT signals) - Step, Ramp, Pulse, Impulse, Sinusoidal, Exponential, Classification of CT and DT signals - Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals - CT systems and DT systems- Classification of systems – Static & Dynamic, Linear & Nonlinear, Time-variant & Time-invariant, Causal & Noncausal, Stable & Unstable.

UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS
Fourier series analysis-spectrum of Continuous Time (CT) signals- Fourier and Laplace Transforms in CT Signal Analysis - Properties.

UNIT III LINEAR TIME INVARIANT- CONTINUOUS TIME SYSTEMS
Differential Equation-Block diagram representation-impulse response, convolution integrals-Fourier and Laplace transforms in Analysis of CT systems

UNIT IV ANALYSIS OF DISCRETE TIME SIGNALS
Baseband Sampling - DTFT – Properties of DTFT - Z Transform – Properties of Z Transform

UNIT V LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS
Difference Equations-Block diagram representation-Impulse response - Convolution sum- Discrete Fourier and Z Transform Analysis of Recursive & Non-Recursive systems

OUTCOMES:
Upon the completion of the course, students will be able to:
- Analyze the properties of signals & systems
- Apply Laplace transform, Fourier transform, Z transform and DTFT in signal analysis
- Analyze continuous time LTI systems using Fourier and Laplace Transforms
- Analyze discrete time LTI systems using Z transform and DTFT

TEXT BOOK:

REFERENCES:

EC6304 ELECTRONIC CIRCUITS – I L T P C
3 1 0 4

OBJECTIVES:
The student should be made to
- Learn about biasing of BJTs and MOSFETs
- Design and construct amplifiers
- Construct amplifiers with active loads
- Study high frequency response of all amplifiers

UNIT I BIASING OF DISCRETE BJT AND MOSFET 9
DC Load line, operating point, Various biasing methods for BJT-Design-Stability-Bias compensation, Thermal stability, Design of biasing for JFET, Design of biasing for MOSFET

UNIT II BJT AMPLIFIERS 9

UNIT III JFET AND MOSFET AMPLIFIERS 9
Small signal analysis of JFT amplifiers- Small signal Analysis of MOSFET and JFET, Common source amplifier, Voltage swing limitations, Small signal analysis of MOSFET and JFET Source follower and Common Gate amplifiers, - BiMOS Cascode amplifier

UNIT IV FREQUENCY ANALYSIS OF BJT AND MOSFET AMPLIFIERS 9
Low circuit current gain, cut off frequency – \( f_a \) and \( f_b \) unity gain and Determination of bandwidth of single stage and multistage amplifiers

UNIT V IC MOSFET AMPLIFIERS 9
IC Amplifiers- IC biasing Current steering circuit using MOSFET- MOSFET current sources- PMOS and NMOS current sources. Amplifier with active loads - enhancement load, Depletion load and PMOS and NMOS current sources load- CMOS common source and source follower- CMOS differential amplifier- CMRR.

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

OUTCOMES:
Upon Completion of the course, the students will be able to:
- Design circuits with transistor biasing.
- Design simple amplifier circuits.
- Analyze the small signal equivalent circuits of transistors.
- Design and analyze large signal amplifiers.

TEXT BOOK:

REFERENCES:

EC6311 ANALOG AND DIGITAL CIRCUITS LABORATORY

OBJECTIVES:
The student should be made to:
- Study the characteristic of CE,CB and CC Amplifier
- Learn the frequency response of CS Amplifiers
- Study the Transfer characteristic of differential amplifier
- Perform experiment to obtain the bandwidth of single stage and multistage amplifiers
- Perform Spice simulation of electronics circuits

LIST OF EXPERIMENTS

LIST OF ANALOG EXPERIMENTS:
1. Frequency Response of CE / CB / CC amplifier
2. Frequency response of CS Amplifiers
3. Darlington Amplifier
5. CMRR Measurement
6. Cascode / Cascade amplifier
7. Determination of bandwidth of single stage and multistage amplifiers
8. Spice Simulation of Common Emitter and Common Source amplifiers

LIST OF DIGITAL EXPERIMENTS
9. Design and implementation of code converters using logic gates
   (i) BCD to excess-3 code and vice versa
   (ii) Binary to gray and vice-versa
10. Design and implementation of 4 bit binary Adder/ Subtractor and BCD adder using IC 7483
11. Design and implementation of Multiplexer and De-multiplexer using logic gates
12. Design and implementation of encoder and decoder using logic gates
13. Construction and verification of 4 bit ripple counter and Mod-10 / Mod-12 Ripple counters
14. Design and implementation of 3-bit synchronous up/down counter
15. Implementation of SISO, SIPO, PISO and PIPO shift registers using Flip-flops

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Differentiate cascade and cascade amplifier.
- Analyze the limitation in bandwidth of single stage and multi stage amplifier
- Simulate amplifiers using Spice
- Measure CMRR in differential amplifier

LAB REQUIREMENT FOR A BATCH OF 30 STUDENTS, 2 STUDENTS / EXPERIMENT:

Equipments for Analog Lab
CRO (30MHz) – 15 Nos.
Signal Generator / Function Generators (3 MHz) – 15 Nos.
Dual Regulated Power Supplies (0 – 30V) – 15 Nos.
Standalone desktop PCs with SPICE software – 15 Nos.
Transistor/FET (BJT-NPN-PNP and NMOS/PMOS) – 50 Nos.

Components and Accessories
Dual power supply/ single mode power supply - 15 Nos
IC Trainer Kit - 15 Nos
Bread Boards -15 Nos
Computer with HDL software -15 Nos
Seven segment display -15 Nos
Multimeter -15 Nos
ICs each 50 Nos
7400/ 7402 / 7404 / 7486 / 7408 / 7432 / 7483 / 74150 /
74151 / 74147 / 7445 / 7476/7491/ 555 / 7494 / 7447 / 74180 /
7485 / 7473 / 74138 / 7411 / 7474

OBJECTIVES:
The student should be made to:
- Learn C++ programming language.
- Be exposed to the different data structures
- Be familiar with applications using different data structures

LIST OF EXPERIMENTS:
1. Basic Programs for C++ Concepts
2. Array implementation of List Abstract Data Type (ADT)
3. Linked list implementation of List ADT
4. Cursor implementation of List ADT
5. Stack ADT - Array and linked list implementations
6. The next two exercises are to be done by implementing the following source files
   i. Program source files for Stack Application 1
   ii. Array implementation of Stack ADT
   iii. Linked list implementation of Stack ADT
   iv. Program source files for Stack Application 2
   v. An appropriate header file for the Stack ADT should be included in (i) and (iv)
7. Implement any Stack Application using array implementation of Stack ADT (by implementing files (i) and (ii) given above) and then using linked list
8. Implementation of Stack ADT (by using files (i) and implementing file (iii))
9. Implement another Stack Application using array and linked list implementations of Stack ADT (by implementing files (iv) and using file (ii), and then by using files (iv) and (iii))
11. Queue ADT – Array and linked list implementations
12. Search Tree ADT - Binary Search Tree
13. Implement an interesting application as separate source files and using any of the searchable ADT files developed earlier. Replace the ADT file alone with other appropriate ADT files. Compare the performance.
14. Quick Sort

TOTAL: 45 PERIODS

REFERENCE:
spoken-tutorial.org.

OUTCOMES:
At the end of the course, the student should be able to:
- Design and implement C++ programs for manipulating stacks, queues, linked lists, trees, and graphs.
- Apply good programming design methods for program development.
- Apply the different data structures for implementing solutions to practical problems.

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:
Standalone desktops with C++ Compiler - 30 Nos.
(or)
Server with C++ compiler supporting 30 terminals or more.

MA6451 Probability and Random Processes

OBJECTIVES:
To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems etc in communication engineering.

UNIT I RANDOM VARIABLES 9+3
Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions.

UNIT II TWO - DIMENSIONAL RANDOM VARIABLES 9+3
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables.

UNIT III RANDOM PROCESSES 9+3
Classification – Stationary process – Markov process - Poisson process – Random telegraph process.

UNIT IV CORRELATION AND SPECTRAL DENSITIES 9+3

UNIT V LINEAR SYSTEMS WITH RANDOM INPUTS 9+3
Linear time invariant system – System transfer function – Linear systems with random inputs – Auto correlation and Cross correlation functions of input and output.

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

OUTCOMES:
- The students will have an exposure of various distribution functions and help in acquiring skills in handling situations involving more than one variable. Able to analyze the response of random inputs to linear time invariant systems.

TEXT BOOKS:

REFERENCES:

EC6401 ELECTRONIC CIRCUITS II

OBJECTIVES:
- To understand the advantages and method of analysis of feedback amplifiers.
- To understand the analysis and design of LC and RC oscillators, amplifiers, multivibrators, and time base generators.

UNIT I FEEDBACK AMPLIFIERS

UNIT II OSCILLATORS
range of RC and LC Oscillators, Quartz Crystal Construction, Electrical equivalent circuit of Crystal, Miller and Pierce Crystal oscillators, frequency stability of oscillators.
UNIT III  TUNED AMPLIFIERS

UNIT IV  WAVE SHAPING AND MULTIVIBRATOR CIRCUITS

UNIT V  BLOCKING OSCILLATORS AND TIMEBASE GENERATORS

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to
- Design and analyze feedback amplifiers.
- Design LC and RC oscillators, tuned amplifiers, wave shaping circuits, multivibrators, blocking oscillators and time base generators.
- Analyze performance of tuned amplifiers.

TEXT BOOK:

REFERENCES:

EC6402  COMMUNICATION THEORY  L T P C
3 0 0 3

OBJECTIVES:
- To introduce the concepts of various analog modulations and their spectral characteristics.
- To understand the properties of random process.
- To know the effect of noise on communication systems.
To study the limits set by Information Theory.

UNIT I AMPLITUDE MODULATION
Generation and detection of AM wave-spectra-DSBSC, Hilbert Transform, Pre-envelope & complex envelope - SSB and VSB –comparison -Superheterodyne Receiver.

UNIT II ANGLE MODULATION
Phase and frequency modulation-Narrow Band and Wind band FM - Spectrum - FM modulation and demodulation – FM Discriminator- PLL as FM Demodulator - Transmission bandwidth.

UNIT III RANDOM PROCESS

UNIT IV NOISE CHARACTERIZATION

UNIT V INFORMATION THEORY
Entropy - Discrete Memoryless channels - Channel Capacity -Hartley - Shannon law - Source coding theorem - Huffman & Shannon - Fano codes

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the students would

- Design AM communication systems.
- Design Angle modulated communication systems
- Apply the concepts of Random Process to the design of Communication systems
- Analyze the noise performance of AM and FM systems

TEXT BOOKS:

REFERENCES:
3. H P Hsu, Schaum Outline Series - “Analog and Digital Communications” TMH 2006
OBJECTIVES:
- To impart knowledge on the basics of static electric and magnetic field and the associated laws.
- To give insight into the propagation of EM waves and also to introduce the methods in computational electromagnetics.
- To make students have depth understanding of antennas, electronic devices, Waveguides is possible.

UNIT I  STATIC ELECTRIC FIELD  9

UNIT II  CONDUCTORS AND DIELECTRICS  9
Conductors and dielectrics in Static Electric Field, Current and current density, Continuity equation, Polarization, Boundary conditions, Method of images, Resistance of a conductor, Capacitance, Parallel plate, Coaxial and Spherical capacitors, Boundary conditions for perfect dielectric materials, Poisson’s equation, Laplace’s equation, Solution of Laplace equation, Application of Poisson’s and Laplace’s equations.

UNIT III  STATIC MAGNETIC FIELDS  9

UNIT IV  MAGNETIC FORCES AND MATERIALS  9

UNIT V  TIME VARYING FIELDS AND MAXWELL’S EQUATIONS  9

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

OUTCOMES:
Upon completion of the course, the students would be able to
- Analyze field potentials due to static changes and static magnetic fields.
- Explain how materials affect electric and magnetic fields.
- Analyze the relation between the fields under time varying situations.
- Discuss the principles of propagation of uniform plane waves.
TEXT BOOKS:

REFERENCES:
1. David K Cheng, “Field and Wave Electromagnetics”, Pearson Education Inc, Delhi, 2004

EC6404 LINEAR INTEGRATED CIRCUITS L T P C

3 0 0 3

OBJECTIVES:
- To introduce the basic building blocks of linear integrated circuits.
- To learn the linear and non-linear applications of operational amplifiers.
- To introduce the theory and applications of analog multipliers and PLL.
- To learn the theory of ADC and DAC.
- To introduce the concepts of waveform generation and introduce some special function ICs.

UNIT I BASICS OF OPERATIONAL AMPLIFIERS
Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, Basic information about op-amps – Ideal Operational Amplifier - General operational amplifier stages -and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, Open and closed loop configurations.

UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS
Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.

UNIT III ANALOG MULTIPLIER AND PLL
Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing.

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS
UNIT V  WAVEFORM GENERATORS AND SPECIAL FUNCTION ICS
Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator - Monolithic switching regulator, Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto-couplers and fibre optic IC.

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to:
- Design linear and non linear applications of op – amps.
- Design applications using analog multiplier and PLL.
- Design ADC and DAC using op – amps.
- Generate waveforms using op – amp circuits.
- Analyze special function ICs.

TEXT BOOKS:

REFERENCES:

EC6405  CONTROL SYSTEM ENGINEERING

OBJECTIVES:
- To introduce the elements of control system and their modeling using various Techniques.
- To introduce methods for analyzing the time response, the frequency response and the stability of systems.
- To introduce the state variable analysis method.
UNIT I   CONTROL SYSTEM MODELING  9
Basic Elements of Control System – Open loop and Closed loop systems - Differential equation - Transfer function, Modeling of Electric systems, Translational and rotational mechanical systems - Block diagram reduction Techniques - Signal flow graph

UNIT II   TIME RESPONSE ANALYSIS  9
Time response analysis - First Order Systems - Impulse and Step Response analysis of second order systems - Steady state errors – P, PI, PD and PID Compensation, Analysis using MATLAB

UNIT III   FREQUENCY RESPONSE ANALYSIS  9

UNIT IV   STABILITY ANALYSIS  9

UNIT V   STATE VARIABLE ANALYSIS  9

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, students will be able to:
- Perform time domain and frequency domain analysis of control systems required for stability analysis.
- Design the compensation technique that can be used to stabilize control systems.

TEXTBOOK:

REFERENCES:
OBJECTIVES:
- To gain hands on experience in designing electronic circuits.
- To learn simulation software used in circuit design.
- To learn the fundamental principles of amplifier circuits
- To understand Bias in Amplifier circuits
- To differentiate Class A, Class B, Darlington Amplifier, differential Amplifiers.
- To study the characteristic of source follower

LIST OF EXPERIMENTS:
DESIGN AND ANALYSIS OF
1. Half and Full wave rectifiers
2. Fixed Bias Amplifier Circuit using BJT.
4. Differential Amplifier Using BJT.
5. Darlington Amplifier.
6. Source Follower with Bootstrapped Circuit.
7. Class A Power Amplifier.
8. Class B Complementary Symmetry Power Amplifier.

SIMULATION USING SPICE:
10. DC response of CS amplifier.

OUTCOMES:
At the end of the course, the student should be able to:
- Analyse the characteristics of rectifiers
- Simulate amplifiers using Spice
- Design Bias Circuit for BJT
- Differentiate Class A and Class B Amplifiers

LAB REQUIREMENT FOR A BATCH OF 30 STUDENTS / 2 STUDENTS PER EXPERIMENT:
CRO (Min 30MHz) – 15 Nos.
Signal Generator /Function Generators (2 MHz) – 15 Nos
Dual Regulated Power Supplies (0 – 30V) – 15 Nos.
Digital Multimeter – 15 Nos
Standalone desktops PC – 15 Nos.
Transistor/FET (BJT-NPN-PNP and NMOS/PMOS) – 50 Nos
Components and Accessories:
Transistors, Resistors, Capacitors, diodes, Bread Boards, Transformers.
SPICE Circuit Simulation Software: (any public domain or commercial software)
OBJECTIVES:
- To expose the students to linear and integrated circuits
- To understand the basics of linear integrated circuits and available ICs
- To understand characteristics of operational amplifier.
- To apply operational amplifiers in linear and nonlinear applications.
- To acquire the basic knowledge of special function IC.
- To use PICE software for circuit design

LIST OF EXPERIMENTS:
DESIGN AND TESTING OF
1. Inverting, Non inverting and Differential amplifiers.
2. Integrator and Differentiator.
3. Instrumentation amplifier
4. Active low-pass, High-pass and band-pass filters.
6. Phase shift and Wien bridge oscillators using op-amp.
7. Astable and monostable multivibrators using NE555 Timer.
8. PLL characteristics and its use as Frequency Multiplier.
9. DC power supply using LM317 and LM723.
10. Study of SMPS.

SIMULATION USING SPICE
1. Simulation of Experiments 3, 4, 5, 6 and 7.
2. D/A and A/D converters (Successive approximation)
3. Analog multiplier
4. CMOS Inverter, NAND and NOR

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Design oscillators and amplifiers using operational amplifiers.
- Design filters using Opamp and perform experiment on frequency response.
- Analyse the working of PLL and use PLL as frequency multiplier.
- Design DC power supply using ICs.
- Analyse the performance of oscillators and multivibrators using SPICE

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS (2 students per Experiment)
CRO (Min 30MHz) – 15 Nos.
Signal Generator /Function Generators (2 MHz) – 15 Nos
Dual Regulated Power Supplies (0 – 30V) – 15 Nos.
Digital Multimeter – 15 Nos.
IC tester - 5 Nos
Standalone desktops PC – 15 Nos.
SPICE Circuit Simulation Software: (any public domain or commercial software)
Components and Accessories: - 50 Nos
Transistors, Resistors, Capacitors, diodes, Zener diodes, Bread Boards, Transformers, wires, Power transistors, Potentiometer, A/D and D/A convertors, LEDs
OBJECTIVES:

- To provide hands on experience with generators and motors.
- To understand the working of DC/AC motors and generators
- To study the characteristics of transducers
- To learn the use of transformer
- To understand the behavior of linear system through simulation
- To gain knowledge of controllers

LIST OF EXPERIMENTS:

1. Study of DC & AC motor starters
2. Study of three phase circuits
3. Speed Control of DC shunt motor
4. Load Test on DC shunt motor
5. OCC & Load Characteristics of DC shunt generator
6. Transfer Function of separately excited D.C. Generator.
7. Regulation of three phase alternator
8. Open Circuit and Short Circuit test on single phase transformer to draw its equivalent circuit
9. Load test on single-phase transformer
10. Load test on single phase and three-phase induction motor
12. Study of transducers and characterization.
14. Stability Analysis of Linear system using MATLAB or equivalent Software.
15. Study the effect of P, PI, PID controllers using MATLAB or equivalent Software.

OUTCOMES:

At the end of the course, the student should be able to:

- Perform experiments to study the load characteristics of DC motors / generators.
- Design bridge network circuit to measure the values of passive component.
- Analyse the stability of linear system through simulation software.
- Obtain transfer function of DC generators.

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. DC Shunt Motor with Loading Arrangement
2. 3HP, 220V, 14A, 750RPM, 0.6A (Shunt field)
3. DC Shunt Motor Coupled With Three phase Alternator
4. DC Shunt Motor - kW: 5.2 / volts: 220 / Amps: 27.5
5. Speed: 1500 RPM/ Field current: 0.9A
6. Three phase Alternator - kVA: 7.5/ volts: 415/ Amps: 10.4
   Speed: 1500 RPM/ Field current: 2A.
7. Single Phase Transformer; 2 KVA, 230/110-166 V
8. Three Phase Induction Motor with Loading Arrangement  
9. (3.7KW,415v,7.5A,1430 RPM)  
10. Single Phase Induction Motor with Loading Arrangement  
11. (230V,5HP,17A)  
12. DC Shunt Motor Coupled With DC Compound Generator  
13. (DC Shunt Motor: kW: 7.4/ volts: 220/ Amps: 38.5/ Speed: 960 RPM / Field current1.2A)  
14. (DC Compound Generator: kW: 7.5/ volts: 220/ Amps: 38.5/ Speed: 960 RPM / Field current1.2A)  
15. Tachometer –Digital/Analog  
16. Single Phase Auto Transformer;(0-270)V  
17. Three Phase Auto Transformer;(0-270)V  
18. MC Voltmeter-(0-300/600)V  
19. MC Ammeter (0-10/20)A  
20. MC Ammeter (0-2/1)A  
21. MI Voltmeter (0-300/600)V  
22. MI Ammeter (0-10/20)A  
23. MI Ammeter (0-1/2)A  
24. UPF Wattmeter (300/600V,10/20A)  
25. LPF Wattmeter (300/600V,10/20A)  
26. Single Phase Resistive Loading Bank(10KW)  
27. Three Phase Resistive Loading Bank(10KW)  
28. SPST switch  
29. Fuse various ranges  
30. Wires  
31. Rheostats(100Ω,1A;250Ω,1.5A;75Ω,16A,1000Ω,1A)  
32. Computers with MATLAB or equivalent Software.

EC6501 DIGITAL COMMUNICATION

OBJECTIVES:
- To know the principles of sampling & quantization
- To study the various waveform coding schemes
- To learn the various baseband transmission schemes
- To understand the various Band pass signaling schemes
- To know the fundamentals of channel coding

UNIT I SAMPLING & QUANTIZATION 9
Low pass sampling – Aliasing- Signal Reconstruction-Quantization - Uniform & non-uniform quantization - quantization noise - Logarithmic Companding of speech signal- PCM - TDM
UNIT II  WAVEFORM CODING  
Prediction filtering and DPCM - Delta Modulation - ADPCM & ADM principles - Linear Predictive Coding

UNIT III  BASEBAND TRANSMISSION  

UNIT IV  DIGITAL MODULATION SCHEME  
Geometric Representation of signals - Generation, detection, PSD & BER of Coherent BPSK, BFSK & QPSK - QAM - Carrier Synchronization - structure of Non-coherent Receivers - Principle of DPSK.

UNIT V  ERROR CONTROL CODING  
Channel coding theorem - Linear Block codes - Hamming codes - Cyclic codes - Convolutional codes - Viterbi Decoder

OUTCOMES:  
Upon completion of the course, students will be able to  
• Design PCM systems  
• Design and implement base band transmission schemes  
• Design and implement band pass signaling schemes  
• Analyze the spectral characteristics of band pass signaling schemes and their noise performance  
• Design error control coding schemes

TEXT BOOK:  

REFERENCES:  
3. H P Hsu, Schaum Outline Series - “Analog and Digital Communications”, TMH 2006  

EC6502 PRINCIPLES OF DIGITAL SIGNAL PROCESSING  
L T P C 3 1 0 4

OBJECTIVES:  
• To learn discrete Fourier transform and its properties  
• To know the characteristics of IIR and FIR filters learn the design of infinite and finite impulse response filters for filtering undesired signals  
• To understand Finite word length effects  
• To study the concept of Multirate and adaptive filters
UNIT I  DISCRETE FOURIER TRANSFORM

UNIT II  IIR FILTER DESIGN
Structures of IIR – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives – (LPF, HPF, BPF, BRFC filter design using frequency translation.

UNIT III  FIR FILTER DESIGN

UNIT IV  FINITE WORDLENGTH EFFECTS
Fixed point and floating point number representations – ADC –Quantization- Truncation and Rounding errors - Quantization noise – coefficient quantization error – Product quantization error - Overflow error – Roundoff noise power - limit cycle oscillations due to product round off and overflow errors – Principle of scaling

UNIT V  DSP APPLICATIONS
Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor – Adaptive Filters: Introduction, Applications of adaptive filtering to equalization.

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

OUTCOMES:
Upon completion of the course, students will be able to
• apply DFT for the analysis of digital signals & systems
• design IIR and FIR filters
• characterize finite Word length effect on filters
• design the Multirate Filters
• apply Adaptive Filters to equalization

TEXT BOOK:

REFERENCES:
OBJECTIVES:
- To introduce the various types of transmission lines and to discuss the losses associated.
- To give thorough understanding about impedance transformation and matching.
- To use the Smith chart in problem solving.
- To impart knowledge on filter theories and waveguide theories

UNIT I  TIME VARRYING FIELDS AND MAXWELL’S EQUATIONS
Motional Electromotive Force, General Expression for motional EMF, Faraday’s Law of Induction, Displacement current, Maxwell’s equation in the point or differential form, Maxwell’s equations in Integral form, Maxwell’s equations from Gauss’s Law, Maxwell’s equations and Boundary conditions, Poynting’s theorem, Time harmonic (sinusoidal) fields, Maxwell’s equations in phasor form.

UNIT II  TRANSMISSION LINES
Need for Transmission Lines, Types of Transmission lines, Characterization in terms of primary and secondary constants, Characteristic impedance, General wave equation, Loss less propagation, Propagation constant, Wave reflection at discontinuities, Voltage standing wave ratio, Transmission line of finite length, The Smith Chart, Smith Chart calculations for lossy lines, Impedance matching by Quarter wave transformer, Single and double stub matching.

UNIT III  THE UNIFORM PLANE WAVE
Wave propagation in free space, Wave propagation in dielectrics, Forward and Backward Travelling Wave, Poynting Theorem and Wave Power, Energy of the Radiated wave, Propagation in good conductors and good dielectrics, Skin effect, Wave polarization, Linearly, Elliptically and Circularly polarized waves.

UNIT IV  TRANSMISSION AND REFLECTION OF PLANE WAVES AT BOUNDARIES

UNIT V  WAVE GUIDES AND CAVITY RESONATORS
General Wave behaviours along uniform Guiding structures, Transverse Electromagnetic waves, Transverse Magnetic waves, Transverse Electric waves, TM and TE waves between parallel plates, TM and TE waves in Rectangular wave guides, Bessel’s differential equation and Bessel function, TM and TE waves in Circular wave guides, Rectangular and circular cavity Resonators.

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

OUTCOMES:
Upon completion of the course, students will be able to:
- Discuss the propagation of signals through transmission lines.
- Analyze signal propagation at Radio frequencies.
- Explain radio propagation in guided systems.
- Utilize cavity resonators.

TEXT BOOK:
1. John D Ryder, “Networks lines and fields”, Prentice Hall of India, New Delhi, 2005
REFERENCES:
2. David K Cheng, “Field and Wave Electromagnetics”, Pearson Education Inc, Delhi, 2004

GE6351 ENVIRONMENTAL SCIENCE AND ENGINEERING

OBJECTIVES:
To the study of nature and the facts about environment.
- To find and implement 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

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

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 environment at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions.
- Development and improvement in standard of living has lead to serious environmental disasters.

TEXT BOOKS:
REFERENCES:

EC6504 MICROPROCESSOR AND MICROCONTROLLER

OBJECTIVES:
The student should be made to:
- Study the Architecture of 8086 microprocessor.
- Learn the design aspects of I/O and Memory Interfacing circuits.
- Study about communication and bus interfacing.
- Study the Architecture of 8051 microcontroller.

UNIT I THE 8086 MICROPROCESSOR
Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

UNIT II 8086 SYSTEM BUS STRUCTURE

UNIT III I/O INTERFACING

UNIT IV MICROCONTROLLER
Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

UNIT V INTERFACING MICROCONTROLLER

OUTCOMES:
At the end of the course, the student should be able to:
- Design and implement programs on 8086 microprocessor.
- Design I/O circuits.
- Design Memory Interfacing circuits.
- Design and implement 8051 microcontroller based systems.

**TEXT BOOKS:**

**REFERENCE:**
1. Doughlas V.Hall, "Microprocessors and Interfacing, Programming and Hardware", TMH,2012

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**EC6511 DIGITAL SIGNAL PROCESSING LABORATORY**

**OBJECTIVES:**
The student should be made to:
- To implement Linear and Circular Convolution
- To implement FIR and IIR filters
- To study the architecture of DSP processor
- To demonstrate Finite word length effect

**LIST OF EXPERIMENTS:**
**MATLAB / EQUIVALENT SOFTWARE PACKAGE**
1. Generation of sequences (functional & random) & correlation
2. Linear and Circular Convolutions
3. Spectrum Analysis using DFT
4. FIR filter design
5. IIR filter design
6. Multirate Filters
7. Equalization

**DSP PROCESSOR BASED IMPLEMENTATION**
8. Study of architecture of Digital Signal Processor
9. MAC operation using various addressing modes
10. Linear Convolution
11. Circular Convolution
12. FFT Implementation
13. Waveform generation
14. IIR and FIR Implementation
15. Finite Word Length Effect

**OUTCOMES:**
Students will be able to
- Carry out simulation of DSP systems
- Demonstrate their abilities towards DSP processor based implementation of DSP systems
- Analyze Finite word length effect on DSP systems
- Demonstrate the applications of FFT to DSP
- Implement adaptive filters for various applications of DSP

TOTAL: 45 PERIODS
LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS (2 STUDENTS PER SYSTEM)
PCs with Fixed / Floating point DSP Processors (Kit / Add-on Cards) 15 Units

LIST OF SOFTWARE REQUIRED:
MATLAB with Simulink and Signal Processing Tool Box or Equivalent Software in desktop systems -15 Nos
Signal Generators (1MHz) – 15 Nos
CRO (20MHz) -15 Nos

EC6512 COMMUNICATION SYSTEMS LABORATORY L T P C 0 0 3 2

OBJECTIVES:
The student should be made to:
• To visualize the effects of sampling and TDM
• To Implement AM & FM modulation and demodulation
• To implement PCM & DM
• To implement FSK, PSK and DPSK schemes
• To implement Equalization algorithms
• To implement Error control coding schemes

LIST OF EXPERIMENTS:
1. Signal Sampling and reconstruction
2. Time Division Multiplexing
3. AM Modulator and Demodulator
4. FM Modulator and Demodulator
5. Pulse Code Modulation and Demodulation
6. Delta Modulation and Demodulation
7. Observation (simulation) of signal constellations of BPSK, QPSK and QAM
8. Line coding schemes
9. FSK, PSK and DPSK schemes (Simulation)
10. Error control coding schemes - Linear Block Codes (Simulation)
11. Communication link simulation
12. Equalization – Zero Forcing & LMS algorithms(simulation)

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• Simulate end-to-end Communication Link
• Demonstrate their knowledge in base band signaling schemes through implementation of FSK, PSK and DPSK
• Apply various channel coding schemes & demonstrate their capabilities towards the improvement of the noise performance of communication system
• Simulate & validate the various functional modules of a communication system
LAB REQUIREMENTS FOR A BATCH OF 30 STUDENTS (3 STUDENTS PER EXPERIMENT):

i) Kits for Signal Sampling, TDM, AM, FM, PCM, DM and Line Coding Schemes
ii) CROs – 15 Nos
iii) MATLAB / SCILAB or equivalent software package for simulation experiments
iv) PCs - 10 Nos

EC6513 MICROPROCESSOR AND MICROCONTROLLER LABORATORY

OBJECTIVES:
The student should be made to:
• Introduce ALP concepts and features
• Write ALP for arithmetic and logical operations in 8086 and 8051
• Differentiate Serial and Parallel Interface
• Interface different I/Os with Microprocessors
• Be familiar with MASM

LIST OF EXPERIMENTS:
8086 Programs using kits and MASM
1. Basic arithmetic and Logical operations
2. Move a data block without overlap
3. Code conversion, decimal arithmetic and Matrix operations.
4. Floating point operations, string manipulations, sorting and searching
5. Password checking, Print RAM size and system date
6. Counters and Time Delay

Peripherals and Interfacing Experiments
7. Traffic light control
8. Stepper motor control
9. Digital clock
10. Key board and Display
11. Printer status
12. Serial interface and Parallel interface
13. A/D and D/A interface and Waveform Generation

8051 Experiments using kits and MASM
14. Basic arithmetic and Logical operations
15. Square and Cube program, Find 2’s complement of a number
16. Unpacked BCD to ASCII

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• Write ALP Programmes for fixed and Floating Point and Arithmetic
• Interface different I/Os with processor
• Generate waveforms using Microprocessors
• Execute Programs in 8051
• Explain the difference between simulator and Emulator
LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:

HARDWARE:
8086 development kits - 30 nos
Interfacing Units - Each 10 nos
Microcontroller - 30 nos

SOFTWARE:
Intel Desktop Systems with MASM - 30 nos
8086 Assembler
8051 Cross Assembler

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 9

UNIT II PLANNING 9

UNIT III ORGANISING 9

UNIT IV DIRECTING 9

UNIT V CONTROLLING 9
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:

CS6303 COMPUTER ARCHITECTURE

OBJECTIVES:
- To make students understand the basic structure and operation of digital computer.
- To understand the hardware-software interface.
- To familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations.
- To expose the students to the concept of pipelining.
- To familiarize the students with hierarchical memory system including cache memories and virtual memory.
- To expose the students with different ways of communicating with I/O devices and standard I/O interfaces.

UNIT I OVERVIEW & INSTRUCTIONS

UNIT II ARITHMETIC OPERATIONS
ALU - Addition and subtraction – Multiplication – Division – Floating Point operations – Subword parallelism.

UNIT III PROCESSOR AND CONTROL UNIT
Basic MIPS implementation – Building datapath – Control Implementation scheme – Pipelining – Pipelined datapath and control – Handling Data hazards & Control hazards – Exceptions.

UNIT IV PARALLELISM
Instruction-level-parallelism – Parallel processing challenges – Flynn’s classification – Hardware multithreading – Multicore processors.
UNIT V MEMORY AND I/O SYSTEMS
Memory hierarchy - Memory technologies – Cache basics – Measuring and improving cache performance - Virtual memory, TLBs - Input/output system, programmed I/O, DMA and interrupts, I/O processors.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• Design arithmetic and logic unit.
• Design and anlayse pipelined control units
• Evaluate performance of memory systems.
• Understand parallel processing architectures.

TEXT BOOK:

REFERENCES:

CS6551 COMPUTER NETWORKS L T P C 3 0 0 3

OBJECTIVES:
The student should be made to:
• Understand the division of network functionalities into layers.
• Be familiar with the components required to build different types of networks
• Be exposed to the required functionality at each layer
• Learn the flow control and congestion control algorithms

UNIT I FUNDAMENTALS & LINK LAYER 9
Building a network – Requirements - Layering and protocols - Internet Architecture – Network software – Performance ; Link layer Services - Framing - Error Detection - Flow control

UNIT II MEDIA ACCESS & INTERNETWORKING 9
Media access control - Ethernet (802.3) - Wireless LANs – 802.11 – Bluetooth - Switching and bridging – Basic Internetworking (IP, CIDR, ARP, DHCP,ICMP )
UNIT III ROUTING 9
Routing (RIP, OSPF, metrics) – Switch basics – Global Internet (Areas, BGP, IPv6), Multicast – addresses – multicast routing (DVMRP, PIM)

UNIT IV TRANSPORT LAYER 9
Overview of Transport layer - UDP - Reliable byte stream (TCP) - Connection management - Flow control - Retransmission – TCP Congestion control - Congestion avoidance (DECBit, RED) – QoS – Application requirements

UNIT V APPLICATION LAYER 9
Traditional applications -Electronic Mail (SMTP, POP3, IMAP, MIME) – HTTP – Web Services – DNS - SNMP

OUTCOMES:
At the end of the course, the student should be able to:
• Identify the components required to build different types of networks
• Choose the required functionality at each layer for given application
• Identify solution for each functionality at each layer
• Trace the flow of information from one node to another node in the network

TEXT BOOK:

REFERENCES:
UNIT I        MOS TRANSISTOR PRINCIPLE  9
NMOS and PMOS transistors, Process parameters for MOS and CMOS, Electrical properties
of CMOS circuits and device modeling, Scaling principles and fundamental limits, CMOS inverter
scaling, propagation delays, Stick diagram, Layout diagrams

UNIT II       COMBINATIONAL LOGIC CIRCUITS  9
Examples of Combinational Logic Design, Elmore’s constant, Pass transistor Logic, Transmission
gates, static and dynamic CMOS design, Power dissipation – Low power design principles

UNIT III      SEQUENTIAL LOGIC CIRCUITS  9
Static and Dynamic Latches and Registers, Timing issues, pipelines, clock strategies, Memory
architecture and memory control circuits, Low power memory circuits, Synchronous and
Asynchronous design

UNIT IV       DESIGNING ARITHMETIC BUILDING BLOCKS  9
Data path circuits, Architectures for ripple carry adders, carry look ahead adders, High speed adders,
accumulators, Multipliers, dividers, Barrel shifters, speed and area tradeoff

UNIT V        IMPLEMENTATION STRATEGIES  9
Full custom and Semi custom design, Standard cell design and cell libraries, FPGA building block
architectures, FPGA interconnect routing procedures.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, students should
- Explain the basic CMOS circuits and the CMOS process technology.
- Discuss the techniques of chip design using programmable devices.
- Model the digital system using Hardware Description Language.

TEXTBOOKS:

REFERENCES:
    1993
    Prentice Hall of India 2005

EC6602  ANTENNA AND WAVE PROPAGATION  L T P C
3 0 0 3

OBJECTIVES:
- To give insight of the radiation phenomena.
- To give a thorough understanding of the radiation characteristics of different types of antennas
- To create awareness about the different types of propagation of radio waves at different
UNIT I  FUNDAMENTALS OF RADIATION  

UNIT II  APERTURE AND SLOT ANTENNAS  
Radiation from rectangular apertures, Uniform and Tapered aperture, Horn antenna, Reflector antenna, Aperture blockage, Feeding structures, Slot antennas, Microstrip antennas – Radiation mechanism – Application, Numerical tool for antenna analysis

UNIT III  ANTENNA ARRAYS  
N element linear array, Pattern multiplication, Broadside and End fire array – Concept of Phased arrays, Adaptive array, Basic principle of antenna Synthesis-Binomial array

UNIT IV  SPECIAL ANTENNAS  

UNIT V  PROPAGATION OF RADIO WAVES  
Modes of propagation, Structure of atmosphere, Ground wave propagation, Tropospheric propagation, Duct propagation, Troposcatter propagation, Flat earth and Curved earth concept Sky wave propagation – Virtual height, critical frequency, Maximum usable frequency – Skip distance, Fading, Multi hop propagation

OUTCOMES:
Upon completion of the course, students will be able to:
- Explain the various types of antennas and wave propagation.
- Write about the radiation from a current element.
- Analyze the antenna arrays, aperture antennas and special antennas such as frequency independent and broad band

TEXT BOOK:

REFERENCES:
OBJECTIVES:
The student should be made to:
- Learn to communicate between two desktop computers.
- Learn to implement the different protocols.
- Be familiar with socket programming.
- Be familiar with the various routing algorithms.
- Be familiar with simulation tools.

LIST OF EXPERIMENTS:
1. Implementation of Error Detection / Error Correction Techniques
2. Implementation of Stop and Wait Protocol and sliding window
3. Implementation and study of Goback-N and selective repeat protocols
4. Implementation of High Level Data Link Control
5. Study of Socket Programming and Client – Server model
6. Write a socket Program for Echo/Ping/Talk commands.
7. To create scenario and study the performance of network with CSMA / CA protocol
   and compare with CSMA/CD protocols.
8. Network Topology - Star, Bus, Ring
9. Implementation of distance vector routing algorithm
10. Implementation of Link state routing algorithm
11. Study of Network simulator (NS) and simulation of Congestion Control Algorithms using NS
12. Encryption and decryption.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to
- Communicate between two desktop computers.
- Implement the different protocols.
- Program using sockets.
- Implement and compare the various routing algorithms.
- Use simulation tool.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS
SOFTWARE
- C / C++ / Java / Equivalent Compiler
- Network simulator like NS2/ NS3 / Glomosim/OPNET/ 30 Equivalent

HARDWARE
Standalone desktops 30 Nos
OBJECTIVES:
- To learn Hardware Descriptive Language (Verilog/VHDL)
- To learn the fundamental principles of VLSI circuit design in digital and analog domain
- To familiarise fusing of logical modules on FPGAs
- To provide hands on design experience with professional design (EDA) platforms.

LIST OF EXPERIMENTS
FPGA BASED EXPERIMENTS.
1. HDL based design entry and simulation of simple counters, state machines, adders (min 8 bit) and multipliers (4 bit min).
2. Synthesis, P&R and post P&R simulation of the components simulated in (I) above. Critical paths and static timing analysis results to be identified. Identify and verify possible conditions under which the blocks will fail to work correctly.
3. Hardware fusing and testing of each of the blocks simulated in (I). Use of either chipscope feature (Xilinx) or the signal tap feature (Altera) is a must. Invoke the PLL and demonstrate the use of the PLL module for clock generation in FPGAs.

IC DESIGN EXPERIMENTS: (BASED ON CADENCE / MENTOR GRAPHICS / EQUIVALENT)
4. Design and simulation of a simple 5 transistor differential amplifier. Measure gain, ICMR, and CMRR
5. Layout generation, parasitic extraction and resimulation of the circuit designed in (I)
7. For expt (c) above, P&R, power and clock routing, and post P&R simulation.
8. Analysis of results of static timing analysis.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to
- Write HDL code for basic as well as advanced digital integrated circuits.
- Import the logic modules into FPGA Boards.
- Synthesize, Place and Route the digital IPs.
- Design, Simulate and Extract the layouts of Analog IC Blocks using EDA tools.

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:
Xilinx or Altera FPGA 10 nos
Xilinx software
Cadence/MAGMA/Tanner or equivalent software package 10 User License
PCs 10 No.s
OBJECTIVES:
- To enable learners to develop their communicative competence.
- To facilitate them to hone their soft skills.
- To equip them with employability skills to enhance their prospect of placements.

UNIT I LISTENING AND SPEAKING SKILLS 12
Conversational skills (formal and informal) – group discussion and interview skills – making presentations.
Listening to lectures, discussions, talk shows, news programmes, dialogues from TV/radio/Ted talk/Podcast – watching videos on interesting events on Youtube.

UNIT II READING AND WRITING SKILLS 12
Reading different genres of tests ranging from newspapers to philosophical treatises – reading strategies such as graphic organizers, summarizing and interpretation.

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) – Graduate Record Examination (GRE) – Civil Service (Language related) – Verbal ability.

UNIT IV SOFT SKILLS (1) 12

UNIT V SOFT SKILLS (2) 12
Multiple intelligences – emotional intelligence – spiritual quotient (ethics) – intercultural communication – creative and critical thinking – learning styles and strategies.

TOTAL: 60 PERIODS

TEACHING METHODS:
- To be totally learner-centric with minimum teacher intervention as the course revolves around practice.
- Suitable audio/video samples from Podcast/YouTube to be used for illustrative purposes.
- Portfolio approach for writing to be followed. Learners are to be encouraged to blog, tweet, text and email employing appropriate language.
- 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.
- 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>
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<tbody>
<tr>
<td>1</td>
<td>Server</td>
<td>1 No.</td>
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<td></td>
<td>• PIV System</td>
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<td></td>
<td>• 1 GB RAM / 40 GB HDD</td>
<td></td>
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<tr>
<td>Item</td>
<td>Description</td>
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<tr>
<td>1.</td>
<td>OS: Win 2000 server</td>
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<tr>
<td>2.</td>
<td>Audio card with headphones</td>
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<td>3.</td>
<td>JRE 1.3</td>
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<tr>
<td>2</td>
<td><strong>Client Systems</strong></td>
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<tr>
<td>4.</td>
<td>PIII System</td>
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<tr>
<td>5.</td>
<td>256 or 512 MB RAM / 40 GB HDD</td>
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<tr>
<td>6.</td>
<td>OS: Win 2000</td>
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<tr>
<td>7.</td>
<td>Audio card with headphones</td>
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<tr>
<td>8.</td>
<td>JRE 1.3</td>
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<tr>
<td>3</td>
<td>Handicam</td>
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<td>4</td>
<td>Television 46”</td>
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<td>5</td>
<td>Collar mike</td>
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<tr>
<td>6</td>
<td>Cordless mike</td>
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<tr>
<td>7</td>
<td>Audio Mixer</td>
<td></td>
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<tr>
<td>8</td>
<td>DVD recorder/player</td>
<td></td>
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<tr>
<td>9</td>
<td>LCD Projector with MP3/CD/DVD provision for Audio/video facility</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>60 Nos.</strong></td>
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</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**

- Online Test: 35 marks
- Interview: 15 marks
- Presentation: 15 marks
- Group Discussion: 15 marks

**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, case studies and abstract concept.

**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
3. 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

EC6701 RF AND MICROWAVE ENGINEERING  L T P C  3 0 0 3

OBJECTIVES:
- To inculcate understanding of the basics required for circuit representation of RF networks.
- To deal with the issues in the design of microwave amplifier.
- To instill knowledge on the properties of various microwave components.
- To deal with the microwave generation and microwave measurement techniques

UNIT I TWO PORT NETWORK THEORY  9
Review of Low frequency parameters: Impedance, Admittance, Hybrid and ABCD parameters, Different types of interconnection of Two port networks, High Frequency parameters, Formulation of S parameters, Properties of S parameters, Reciprocal and lossless Network, Transmission matrix, RF behavior of Resistors, Capacitors and Inductors.

UNIT II RF AMPLIFIERS AND MATCHING NETWORKS  9
Characteristics of Amplifiers, Amplifier power relations, Stability considerations, Stabilization Methods, Noise Figure, Constant VSWR, Broadband, High power and Multistage Amplifiers, Impedance matching using discrete components, Two component matching Networks, Frequency response and quality factor, T and Pi Matching Networks, Microstrip Line Matching Networks.

UNIT III PASSIVE AND ACTIVE MICROWAVE DEVICES  9
Terminations, Attenuators, Phase shifters, Directional couplers, Hybrid Junctions, Power dividers, Circulator, Isolator, Impedance matching devices: Tuning screw, Stub and quarter wave transformers, Crystal and Schottkey diode detector and mixers, PIN diode switch, Gunn diode oscillator, IMPATT diode oscillator and amplifier, Varactor diode, Introduction to MIC.

UNIT IV MICROWAVE GENERATION  9
Review of conventional vacuum Triodes, Tetrodes and Pentodes, High frequency effects in vacuum Tubes, Theory and application of Two cavity Klystron Amplifier, Reflex Klystron oscillator, Traveling wave tube amplifier, Magnetron oscillator using Cylindrical, Linear, Coaxial Voltage tunable Magnetrons, Backward wave Crossed field amplifier and oscillator.
UNIT V  MICROWAVE MEASUREMENTS  9
TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, students will be able to:
- Explain the active & passive microwave devices & components used in Microwave communication systems.
- Analyze the multi- port RF networks and RF transistor amplifiers.
- Generate Microwave signals and design microwave amplifiers.
- Measure and analyze Microwave signal and parameters.

TEXT BOOKS:

REFERENCES:

EC6702  OPTICAL COMMUNICATION AND NETWORKS  L T P C  3 0 0 3

OBJECTIVES:
- To Facilitate the knowledge about optical fiber sources and transmission techniques
- To Enrich the idea of optical fiber networks algorithm such as SONET/SDH and optical CDMA.
- To Explore the trends of optical fiber measurement systems.

UNIT I  INTRODUCTION TO OPTICAL FIBERS  9

UNIT II  SIGNAL DEGRADATION OPTICAL FIBERS  9
UNIT III FIBER OPTICAL SOURCES AND COUPLING 9

UNIT IV FIBER OPTIC RECEIVER AND MEASUREMENTS 9

UNIT V OPTICAL NETWORKS AND SYSTEM TRANSMISSION 9

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, students will be able to:
- Discuss the various optical fiber modes, configurations and various signal degradation factors associated with optical fiber.
- Explain the various optical sources and optical detectors and their use in the optical communication system.
- Analyze the digital transmission and its associated parameters on system performance.

TEXT BOOKS:

REFERENCES:

EC6703 EMBEDDED AND REAL TIME SYSTEMS L T P C 3 0 0 3

OBJECTIVES:
The student should be made to:
- Learn the architecture and programming of ARM processor.
- Be familiar with the embedded computing platform design and analysis.
- Be exposed to the basic concepts of real time Operating system.
- Learn the system design techniques and networks for embedded systems
UNIT I INTRODUCTION TO EMBEDDED COMPUTING AND ARM PROCESSORS
Complex systems and micro processors– Embedded system design process –Design example: Model train controller- Instruction sets preliminaries - ARM Processor – CPU: programming input and output-supervisor mode, exceptions and traps – Co-processors- Memory system mechanisms – CPU performance- CPU power consumption.

UNIT II EMBEDDED COMPUTING PLATFORM DESIGN
The CPU Bus-Memory devices and systems–Designing with computing platforms – consumer electronics architecture – platform-level performance analysis - Components for embedded programs- Models of programs- Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization – Program level energy and power analysis and optimization – Analysis and optimization of program size- Program validation and testing.

UNIT III PROCESSES AND OPERATING SYSTEMS
Introduction – Multiple tasks and multiple processes – Multirate systems- Preemptive real-time operating systems- Priority based scheduling- Interprocess communication mechanisms – Evaluating operating system performance- power optimization strategies for processes – Example Real time operating systems-POSIX- Windows CE.

UNIT V SYSTEM DESIGN TECHNIQUES AND NETWORKS
Design methodologies- Design flows - Requirement Analysis – Specifications-System analysis and architecture design – Quality Assurance techniques- Distributed embedded systems – MPSoCs and shared memory multiprocessors.

UNIT V CASE STUDY
Data compressor - Alarm Clock - Audio player - Software modem- Digital still camera - Telephone answering machine-Engine control unit – Video accelerator. TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, students will be able to:
- Describe the architecture and programming of ARM processor.
- Outline the concepts of embedded systems
- Explain the basic concepts of real time Operating system design.
- Use the system design techniques to develop software for embedded systems
- Differentiate between the general purpose operating system and the real time operating system
- Model real-time applications using embedded-system concepts

TEXT BOOK:

REFERENCES:

EC6711 EMBEDDED LABORATORY

OBJECTIVES:
The student should be made to:
• Learn the working of ARM processor
• Understand the Building Blocks of Embedded Systems
• Learn the concept of memory map and memory interface
• Know the characteristics of Real Time Systems
• Write programs to interface memory, I/Os with processor
• Study the interrupt performance

LIST OF EXPERIMENTS
1. Study of ARM evaluation system
2. Interfacing ADC and DAC.
3. Interfacing LED and PWM.
4. Interfacing real time clock and serial port.
5. Interfacing keyboard and LCD.
6. Interfacing EPROM and interrupt.
7. Mailbox.
8. Interrupt performance characteristics of ARM and FPGA.
9. Flashing of LEDS.
10. Interfacing stepper motor and temperature sensor.
11. Implementing zigbee protocol with ARM.

OUTCOMES:
At the end of the course, the student should be able to:
• Write programs in ARM for a specific Application
• Interface memory and Write programs related to memory operations
• Interface A/D and D/A convertors with ARM system
• Analyse the performance of interrupt
• Write programmes for interfacing keyboard, display, motor and sensor.
• Formulate a mini project using embedded system

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS (3 students per batch)
1. Embedded trainer kits with ARM board 10 No.s
2. Embedded trainer kits suitable for wireless communication 10 No.s
3. Adequate quantities of Hardware, software and consumables
OBJECTIVES:
The student should be made to:
1. Understand the working principle of optical sources, detector, fibers and microwave components
2. Develop understanding of simple optical communication link.
3. Learn about the characteristics and measurements in optical fiber
4. Know about the behavior of microwave components.
5. Practice microwave measurement procedures

LIST OF EXPERIMENTS
OPTICAL EXPERIMENTS
1. DC Characteristics of LED and PIN Photo diode
2. Mode Characteristics of Fibers
3. Measurement of connector and bending losses
4. Fiber optic Analog and Digital Link- frequency response(analog) and eye diagram (digital)
5. Numerical Aperture determination for Fibers
6. Attenuation Measurement in Fibers

MICROWAVE EXPERIMENTS
1. Reflex klystron or Gunn diode characteristics and basic microwave parameter measurement such as VSWR, frequency, wavelength.
2. Directional Coupler Characteristics.
3. Radiation Pattern of Horn Antenna.
4. S-parameter Measurement of the following microwave components (Isolator, Circulator, E plane Tee, H Plane Tee, Magic Tee)
5. Attenuation and Power Measurement

TOTAL: 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS 3 STUDENTS PER EXPERIMENT:
1. Trainer kit for carrying out LED and PIN diode characteristics, Digital multi meter, optical power meter. – 2 Nos
2. Trainer kit for determining the mode characteristics, losses in optical fiber.- 2 Nos
3. Trainer kit for analyzing Analog and Digital link performance, 2 Mbps PRBS Data source, 10 MHz signal generator, 20 MHz Digital storage Oscilloscope. - 2 Nos
4. Kit for measuring Numerical aperture and Attenuation of fiber - 2 Nos
5. MM/SM Glass and plastic fiber patch chords with ST/SC/E2000 connectors - 2 set
7. PIN PDs with ST / SC / E2000 receptacles – 650 / 850 nm - 2 set
8. Microwave test Bench at X band to determine Directional coupler characteristics. - 2 Nos
9. Microwave test Bench at X band and Antenna turn table to measure Radiation pattern of Horn antenna, 2 Horn antennas. - 2 Nos
10. Microwave test Bench at X band to determine VSWR for Isolator and Circulator, VSWR meter, Isolator, Circulator, E Plane Tee, H plane Tee. - 2 Nos
11. Microwave test Bench at X band, Variable attenuator, Detector and 20 MHz Digital / Analog Oscilloscope. - 2 Nos

Note: Microwave test bench comprises of Reflex klystron or Gunn diode with power supply, Gunn oscillator, PIN modulator, Isolator, Fixed and Variable Attenuator, frequency meter, Slotted
section, Wave guides, detector with mount, Termination, Movable short, Slide screw tuner, Horn antenna, Directional coupler and 20 MHz Digital / Analog Oscilloscope.

OUTCOMES:
At the end of the course, the student should be able to:
- Analyze the performance of simple optical link.
- Test microwave and optical components.
- Analyze the mode characteristics of fiber
- Analyze the radiation of pattern of antenna.

EC6801 WIRELESS COMMUNICATION

OBJECTIVES:
The student should be made to:
- Know the characteristic of wireless channel
- Learn the various cellular architectures
- Understand the concepts behind various digital signaling schemes for fading channels
- Be familiar the various multipath mitigation techniques
- Understand the various multiple antenna systems

UNIT I WIRELESS CHANNELS

UNIT II CELLULAR ARCHITECTURE
Multiple Access techniques - FDMA, TDMA, CDMA – Capacity calculations–Cellular concept-Frequency reuse - channel assignment- hand off- interference & system capacity- trunking & grade of service – Coverage and capacity improvement.

UNIT III DIGITAL SIGNALING FOR FADING CHANNELS
Structure of a wireless communication link, Principles of Offset-QPSK, p/4-DQPSK, Minimum Shift Keying, Gaussian Minimum Shift Keying, Error performance in fading channels, OFDM principle – Cyclic prefix, Windowing, PAPR.

UNIT IV MULTIPATH MITIGATION TECHNIQUES
Equalisation – Adaptive equalization, Linear and Non-Linear equalization, Zero forcing and LMS Algorithms. Diversity – Micro and Macrodiversity, Diversity combining techniques, Error probability in fading channels with diversity reception, Rake receiver,

UNIT V MULTIPLE ANTENNA TECHNIQUES
MIMO systems – spatial multiplexing -System model -Pre-coding - Beam forming - transmitter diversity, receiver diversity- Channel state information-capacity in fading and non-fading channels.

TOTAL: 45 PERIODS

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

- Characterize wireless channels
- Design and implement various signaling schemes for fading channels
- Design a cellular system
- Compare multipath mitigation techniques and analyze their performance
- Design and implement systems with transmit/receive diversity and MIMO systems and analyze their performance

TEXTBOOKS:


REFERENCES:


EC6802 WIRELESS NETWORKS

OBJECTIVES:

- To study about Wireless networks, protocol stack and standards.
- To study about fundamentals of 3G Services, its protocols and applications.
- To study about evolution of 4G Networks, its architecture and applications.

UNIT I WIRELESS LAN

UNIT II MOBILE NETWORK LAYER

UNIT III MOBILE TRANSPORT LAYER
UNIT IV WIRELESS WIDE AREA NETWORK

UNIT V 4G NETWORKS

OUTCOMES:
Upon completion of the course, the students will be able to
- Conversant with the latest 3G/4G and WiMAX networks and its architecture.
- Design and implement wireless network environment for any application using latest wireless protocols and standards.
- Implement different type of applications for smart phones and mobile devices with latest network strategies.

TEXT BOOKS:

REFERENCES:

EC6811 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.

EC6001 MEDICAL ELECTRONICS

OBJECTIVES:
- To gain knowledge about the various physiological parameters both electrical and non electrical and the methods of recording and also the method of transmitting these parameters.
- To study about the various assist devices used in the hospitals.
- To gain knowledge about equipment used for physical medicine and the various recently developed diagnostic and therapeutic techniques.

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING 9
The origin of Bio-potentials; biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, lead systems and recording methods, typical waveforms and signal characteristics.

UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT 9
pH, PO$_2$, PCO$_2$, colorimeter, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood Cell Counters.

UNIT III ASSIST DEVICES 9
Cardiac pacemakers, DC Defibrillator, Dialyser, Heart lung machine

UNIT IV PHYSICAL MEDICINE AND BIOTELEMETRY 9
Diathermies- Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy Telemetry principles, frequency selection, biotelemetry, radiopill, electrical safety

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION 9
Thermograph, endoscopy unit, Laser in medicine, cryogenic application, Introduction to telemedicine

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, students will be able to:
- Discuss the application of electronics in diagnostic and therapeutic area.
- Measure biochemical and various physiological information.
- Describe the working of units which will help to restore normal functioning.

TEXTBOOKS:
REFERENCES:

EC6002 ADVANCED DIGITAL SIGNAL PROCESSING

OBJECTIVES:
- To bring out the concepts related to stationary and non-stationary random signals
- To emphasize the importance of true estimation of power spectral density
- To introduce the design of linear and adaptive systems for filtering and linear prediction
- To introduce the concept of wavelet transforms in the context of image processing

UNIT I DISCRETE-TIME RANDOM SIGNALS

UNIT II SPECTRUM ESTIMATION
Bias and Consistency, Periodogram, Modified periodogram, Blackman-Tukey method, Welch method, Parametric methods of spectral estimation, Levinson-Durbin recursion

UNIT III LINEAR ESTIMATION AND PREDICTION
Forward and Backward linear prediction, Filtering - FIR Wiener filter- Filtering and linear prediction, non-causal and causal IIR Wiener filters, Discrete Kalman filter.

UNIT IV ADAPTIVE FILTERS

UNIT V WAVELET TRANSFORM
Multiresolution analysis, Continuous and discrete wavelet transform, Short Time Fourier Transform, Application of wavelet transform, Cepstrum and Homomorphic filtering.

OUTCOMES:
Upon completion of the course, students will be able to:
- Explain the parametric methods for power spectrum estimation.
- Discuss adaptive filtering techniques using LMS algorithm and the applications of adaptive filtering.
- Analyze the wavelet transforms.
TEXTBOOKS:

REFERENCE:

CS6401 OPERATING SYSTEMS

OBJECTIVES:
The student should be made to:
- Study the basic concepts and functions of operating systems.
- Understand the structure and functions of OS.
- Learn about Processes, Threads and Scheduling algorithms.
- Understand the principles of concurrency and Deadlocks.
- Learn various memory management schemes.
- Study I/O management and File systems.
- Learn the basics of Linux system and perform administrative tasks on Linux Servers.

UNIT I OPERATING SYSTEMS OVERVIEW


UNIT II PROCESS MANAGEMENT


UNIT III STORAGE MANAGEMENT

Main Memory-Contiguous Memory Allocation, Segmentation, Paging, 32 and 64 bit architecture Examples; Virtual Memory- Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory, OS Examples.

UNIT IV I/O SYSTEMS

UNIT V  CASE STUDY

Linux System- Basic Concepts; System Administration- Requirements for Linux System Administrator, Setting up a LINUX Multifunction Server, Domain Name System, Setting Up Local Network Services; Virtualization- Basic Concepts, Setting Up Xen, VMware on Linux Host and Adding Guest OS.

OUTCOMES:

At the end of the course, the student should be able to:

- Design various Scheduling algorithms.
- Apply the principles of concurrency.
- Design deadlock, prevention and avoidance algorithms.
- Compare and contrast various memory management schemes.
- Design and Implement a prototype file systems.
- Perform administrative tasks on Linux Servers.

TEXT BOOK:


REFERENCES:

5. http://nptel.ac.in/.

EC6003  ROBOTICS AND AUTOMATION

OBJECTIVES:

- To study the various parts of robots and fields of robotics.
- To study the various kinematics and inverse kinematics of robots.
- To study the Euler, Lagrangian formulation of Robot dynamics.
- To study the trajectory planning for robot.
- To study the control of robots for some specific applications.

UNIT I  BASIC CONCEPTS

Definition and origin of robotics – different types of robotics – various generations of robots – degrees of freedom – Asimov’s laws of robotics – dynamic stabilization of robots.

UNIT II  POWER SOURCES AND SENSORS


UNIT III  MANIPULATORS, ACTUATORS AND GRIPPERS

**UNIT IV**  **KINEMATICS AND PATH PLANNING**  
Solution of inverse kinematics problem – multiple solution jacobian work envelop – hill Climbing Techniques – robot programming languages

**UNIT V**  **CASE STUDIES**  

**OUTCOMES:**  
Upon completion of the course, the student should be able to:
- Explain the basic concepts of working of robot
- Analyze the function of sensors in the robot
- Write program to use a robot for a typical application
- Use Robots in different applications

**TEXT BOOKS:**  

**REFERENCES:**  

**EC6004**  **SATELLITE COMMUNICATION**  

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**OBJECTIVES:**  
- To understand the basics of satellite orbits.
- To understand the satellite segment and earth segment.
- To analyze the various methods of satellite access.
- To understand the applications of satellites.

**UNIT I**  **SATELLITE ORBITS**  
UNIT II  SPACE SEGMENT AND SATELLITE LINK DESIGN

Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command. Satellite uplink and downlink Analysis and Design, link budget, E/N calculation- performance impairments-system noise, inter modulation and interference, Propagation Characteristics and Frequency considerations- System reliability and design lifetime.

UNIT III  EARTH SEGMENT


UNIT IV  SATELLITE ACCESS


UNIT V  SATELLITE APPLICATIONS

INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. Direct Broadcast satellites (DBS)- Direct to home Broadcast (DTH), Digital audio broadcast (DAB)- Worldspace services, Business TV(BTV), GRAMSAT, Specialized services - E –mail, Video conferencing, Internet.

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to:
- Analyze the satellite orbits.
- Analyze the earth segment and space segment.
- Design various satellite applications

TEXT BOOK:

REFERENCES:

EC6005 ELECTRONIC TESTING

OBJECTIVES:
- To understand the basics of testing and the testing equipments
- To understand the different testing methods

UNIT I INTRODUCTION
Test process and automatic test equipment, test economics and product quality, fault modeling

UNIT II DIGITAL TESTING
Logic and fault simulation, testability measures, combinational and sequential circuit test generation.

UNIT III ANALOG TESTING
Memory Test, DSP Based Analog and Mixed Signal Test, Model based analog and mixed signal test, delay test, I/DQ test.

UNIT IV DESIGN FOR TESTABILITY
Built-in self-test, Scan chain design, Random Logic BIST, Memory BIST, Boundary scan test standard, Analog test bus, Functional Microprocessor Test, Fault Dictionary, Diagnostic Tree, Testable System Design, Core Based Design and Test Wrapper Design, Test design for SOC's

UNIT V LOADED BOARD TESTING
Unpowered short circuit tests, unpowered analog tests, Powered in-circuit analog, digital and mixed signal tests, optical and X-ray inspection procedures, functional block level design of in-circuit test equipment

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, students
- Explain different testing equipments.
- Design the different testing schemes for a circuit.
- Discuss the need for test process

TEXT BOOK:

REFERENCE:

EC6006 AVIONICS

OBJECTIVES:
- To understand the needs for avionics for both Civil and military aircraft.
- To introduce various digital electronic principles and working operations of digital circuit.
- To integrate the digital electronics with cockpit equipments
- To understand the various principles in flight disk and cockpit panels.
- To study the communication and navigation equipment
- To study certificate aspects of the Avionics system

90
UNIT I       INTRODUCTION TO AVIONICS  

UNIT II      DIGITAL AVIONICS BUS ARCHITECTURE  

UNIT III     FLIGHT DECK AND COCKPITS  
Control and display technologies CRT, LED, LCD, EL and plasma panel - Touch screen - Direct voice input (DVI) – ARINC 818-Civil cockpit and military cockpit: MFDS, PFDS-HUD, HMD, HMI

UNIT IV      AVIONICS SYSTEMS  

UNIT V      ON BOARD NAVIGATION SYSTEMS  
Over view of navigational aids, Flight planning, Area navigation, required time of arrival, RNAV architecture, performance aspects, approach and landing challenges, regulatory and safety aspects, INS, GPS and GNSS characteristics.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, students will:
- Describe the hardware required for aircraft.
- Explain the communication and navigation techniques used in aircrafts.
- Discuss about the autopilot and cockpit display related concepts.

TEXT BOOK:

REFERENCES:

CS6012       SOFT COMPUTING  
OBJECTIVES:
The student should be made to:
- Learn the various soft computing frame works
- Be familiar with design of various neural networks
- Be exposed to fuzzy logic
- Learn genetic programming.
- Be exposed to hybrid systems.

**UNIT I  INTRODUCTION**


**UNIT II  NEURAL NETWORKS**


**UNIT III  FUZZY LOGIC**


**UNIT IV  GENETIC ALGORITHM**


**UNIT V  HYBRID SOFT COMPUTING TECHNIQUES & APPLICATIONS**


**OUTCOMES:**

Upon completion of the course, the student should be able to:

- Apply various soft computing frame works.
- Design of various neural networks.
- Use fuzzy logic.
- Apply genetic programming.
- Discuss hybrid soft computing.

**TEXT BOOKS:**

REFERENCES:

IT6005 DIGITAL IMAGE PROCESSING L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- Learn digital image fundamentals.
- Be exposed to simple image processing techniques.
- Be familiar with image compression and segmentation techniques.
- Learn to represent image in form of features.

UNIT I DIGITAL IMAGE FUNDAMENTALS 8

UNIT II IMAGE ENHANCEMENT 10

UNIT III IMAGE RESTORATION AND SEGMENTATION 9

UNIT IV WAVELETS AND IMAGE COMPRESSION 9

UNIT V IMAGE REPRESENTATION AND RECOGNITION 9
OUTCOMES:
Upon successful completion of this course, students will be able to:

- Discuss digital image fundamentals.
- Apply image enhancement and restoration techniques.
- Use image compression and segmentation techniques.
- Represent features of images.

TEXT BOOK:

REFERENCES:

EC6007 SPEECH PROCESSING L T P C
3 0 0 3

OBJECTIVES:
- To introduce speech production and related parameters of speech.
- To show the computation and use of techniques such as short time Fourier transform, linear predictive coefficients and other coefficients in the analysis of speech.
- To understand different speech modeling procedures such as Markov and their implementation issues.

UNIT I BASIC CONCEPTS 10

UNIT II SPEECH ANALYSIS 10

UNIT III SPEECH MODELING 8
UNIT IV  SPEECH RECOGNITION  8
Large Vocabulary Continuous Speech Recognition: Architecture of a large vocabulary continuous
speech recognition system – acoustics and language models – n-grams, context dependent sub-word
units; Applications and present status.

UNIT V  SPEECH SYNTHESIS  9
Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, sub-word units for TTS,
intelligibility and naturalness – role of prosody, Applications and present status.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, students will be able to:
• Model speech production system and describe the fundamentals of speech.
• Extract and compare different speech parameters.
• Choose an appropriate statistical speech model for a given application.
• Design a speech recognition system.
• Use different speech synthesis techniques.

TEXTBOOKS:
2. Daniel Jurafsky and James H Martin, “Speech and Language Processing – An Introduction to
   Natural Language Processing, Computational Linguistics, and Speech Recognition”, Pearson

REFERENCES:
4. Ben Gold and Nelson Morgan, “Speech and Audio Signal Processing, Processing and

EC6008  WEB TECHNOLOGY  L T P C  3 0 0 3

OBJECTIVES:
• To design and create user interfaces using Java frames and applets.
• To have a basic idea about network programming using Java.
• To create simple Web pages and provide client side validation.
• To create dynamic web pages using server side scripting

UNIT I  JAVA FUNDAMENTALS  9
Java Data types – Class – Object – I / O Streams – File Handling concepts – Threads – Applets –
Swing Framework – Reflection
UNIT II       JAVA NETWORKING FUNDAMENTALS

UNIT III      CLIENT SIDE TECHNOLOGIES

UNIT IV     SERVER SIDE TECHNOLOGIES

UNIT V       APPLICATION DEVELOPMENT ENVIRONMENT

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, students will be able to:
- Have knowledge about the fundamental Java networking technologies.
- Design their own web services using the client server concepts
- Describe the techniques involved to support real-time Software development.

TEXT BOOK:

REFERENCES:

EC6009       ADVANCED COMPUTER ARCHITECTURE
OBJECTIVES:
The student should be made to:
- Understand the micro-architectural design of processors
- Learn about the various techniques used to obtain performance improvement and power savings in current processors
UNIT I  FUNDAMENTALS OF COMPUTER DESIGN  9
Review of Fundamentals of CPU, Memory and IO – Trends in technology, power, energy and cost, Dependability - Performance Evaluation

UNIT II  INSTRUCTION LEVEL PARALLELISM  9

UNIT III  DATA-LEVEL PARALLELISM  9
Vector architecture – SIMD extensions – Graphics Processing units – Loop level parallelism.

UNIT IV  THREAD LEVEL PARALLELISM  9
Symmetric and Distributed Shared Memory Architectures – Performance Issues –Synchronization – Models of Memory Consistency – Case studies: Intel i7 Processor, SMT & CMP Processors

UNIT V  MEMORY AND I/O  9

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• Evaluate performance of different architectures with respect to various parameters
• Analyze performance of different ILP techniques
• Identify cache and memory related issues in multi-processors

TEXT BOOK:

REFERENCES:

EC6010  ELECTRONICS PACKAGING  L T P C
3 0 0 3

OBJECTIVES:
• To give a comprehensive introduction to the various packaging types used along with the associated same the thermal, speed, signal and integrity power issues.
• To introduce about CAD used in designing wiring boards
UNIT I    OVERVIEW OF ELECTRONIC SYSTEMS PACKAGING  9
Definition of a system and history of semiconductors, Products and levels of packaging, Packaging aspects of handheld products, Definition of PWB, Basics of Semiconductor and Process flowchart, Wafer fabrication, inspection and testing, Wafer packaging; Packaging evolution; Chip connection choices, Wire bonding, TAB and flip chip.

UNIT II    SEMICONDUCTOR PACKAGES  9
Single chip packages or modules (SCM), Commonly used packages and advanced packages; Materials in packages; Thermal mismatch in packages; Multichip modules (MCM)-types; System-in-package (SIP); Packaging roadmaps; Hybrid circuits; Electrical Design considerations in systems packaging, Resistive, Capacitive and Inductive Parasitics, Layout guidelines and the Reflection problem, Interconnection.

UNIT III    CAD FOR PRINTED WIRING BOARDS  9
Benefits from CAD; Introduction to DFM, DFR & DFT, Components of a CAD package and its highlights, Beginning a circuit design with schematic work and component, layout, DFM check, list and design rules; Design for Reliability,Printed Wiring Board Technologies: Board-level packaging aspects, Review of CAD output files for PCB fabrication; Photo plotting and mask generation, Process flow-chart; Vias; PWB substrates; Surface preparation, Photoresist and application methods; UV exposure and developing; Printing technologies for PWBs, PWB etching; PWB etching; Resist stripping; Screen-printing technology, through-hole manufacture process steps; Panel and pattern plating methods, Solder mask for PWBs; Multilayer PWBs; Introduction to, microvias, Microvia technology and Sequential build-up technology process flow for high-density, interconnects

UNIT IV    SURFACE MOUNT TECHNOLOGY AND THERMAL CONSIDERATIONS  9
SMD benefits; Design issues; Introduction to soldering, Reflow and Wave Soldering methods to attach SMDs, Solders; Wetting of solders; Flux and its properties; Defects in wave soldering, Vapour phase soldering, BGA soldering and Desoldering/Repair; SMT failures, SMT failure library and Tin Whisker, Tin-lead and lead-free solders; Phase diagrams; Thermal profiles for reflow soldering; Lead free Alloys, Lead-free solder considerations; Green electronics; RoHS compliance and e-waste recycling, Issues, Thermal Design considerations in systems packaging (L. Umanand, Thermal Design considerations in systems packaging

UNIT V    EMBEDDED PASSIVES TECHNOLOGY  9
Introduction to embedded passives; Need for embedded passives; Design Library; Embedded resistor processes, Embedded capacitors; Processes for embedding capacitors; Case study examples.

TOTAL: 45 PERIODS

OUTCOMES:
Given an electronic system PCB or integrated circuit design specifications, the student should be in a position to recommend the appropriate packaging style to be used, and propose a design a design procedure and solution for the same.

TEXT BOOK:

REFERENCE:
OBJECTIVES:
- To tutor the basics of EMI, EMC
- To instill knowledge on the EMI coupling mechanism and its mitigation techniques
- To impart comprehensive insight about the current EMC standards and about various measurement techniques

UNIT I       BASIC THEORY
Introduction to EMI and EMC, Intra and inter system EMI, Elements of Interference, Sources and Victims of EMI, Conducted and Radiated EMI emission and susceptibility, Case Histories, Radiation hazards to humans, Various issues of EMC, EMC Testing categories, EMC Engineering Application.

UNIT II      COUPLING MECHANISM
Electromagnetic field sources and Coupling paths, Coupling via the supply network, Common mode coupling, Differential mode coupling, Impedance coupling, Inductive and Capacitive coupling, Radiative coupling, Ground loop coupling, Cable related emissions and coupling, Transient sources, Automotive transients.

UNIT III    EMI MITIGATION TECHNIQUES
Working principle of Shielding and Murphy’s Law, LF Magnetic shielding, Apertures and shielding effectiveness, Choice of Materials for H, E, and free space fields, Gasketting and sealing, PCB Level shielding, Principle of Grounding, Isolated grounds, Grounding strategies for Large systems, Grounding for mixed signal systems, Filter types and operation, Surge protection devices, Transient protection.

UNIT IV     STANDARDS AND REGULATION

UNIT V     EMI TEST METHODS AND INSTRUMENTATION
Fundamental considerations, EMI Shielding effectiveness tests, Open field test, TEM cell for immunity test, Shielded chamber, Shielded anechoic chamber, EMI test receivers, Spectrum analyzer, EMI test wave simulators, EMI coupling networks, Line impedance stabilization networks, Feed through capacitors, Antennas, Current probes, MIL-STD test methods, Civilian STD test methods.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, students will be able to:
- Find solution to EMI Sources, EMI problems in PCB level / Subsystem and system level design.
- To measure emission immunity level from different systems to couple with the prescribed EMC standards

TEXT BOOK:
REFERENCES:

EC6012 CMOS ANALOG IC DESIGN

OBJECTIVES:
- To study designs with better precision in data conversion
- To study various ADC and DAC circuit architectures

UNIT I SAMPLE AND HOLD
Properties of MOS Switches, multiplexed input architectures, recycling architecture, open and closed loop sampling architectures, switched capacitor and current mode architectures.

UNIT II BUILDING BLOCK OF DATA CONVERSION CIRCUITS:
Amplifiers, open loop and closed loop amplifiers, gain boosting, common mode feedback, bipolar, CMOS and BiCMOS comparators.

UNIT III PRECISION TECHNIQUES
Comparator cancellation, input and output offset storage principles, comparators using offset cancelled latches, opamp offset cancellation, ADC and DAC calibration techniques.

UNIT IV ADC/DAC ARCHITECTURES
DAC Performance metrics, reference multiplication and division, switching and logical functions of DACs, Current steering architectures, DAC Performance metrics, Flash ADC architecture, Gray encoding, thermometer encoding and metastability.

UNIT V OVER SAMPLING CONVERTERS
Delta sigma modulators, alternative modulator architectures, quantization and noise shaping, decimation filtering, implementation of Delta sigma modulators, delta sigma DACs,

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the student should be able to:
- Build Data Conversion circuits.
- Discuss calibration techniques
- Analyze ADC/DAC Architecture and Performance

TEXT BOOK:

REFERENCE:
OBJECTIVES:
- To expose the students to the fundamentals of microprocessor architecture.
- To introduce the advanced features in microprocessors and microcontrollers.
- To enable the students to understand various microcontroller architectures.

UNIT I HIGH PERFORMANCE CISC ARCHITECTURE – PENTIUM

UNIT II HIGH PERFORMANCE RISC ARCHITECTURE – ARM

UNIT III ARM APPLICATION DEVELOPMENT

UNIT IV MOTOROLA 68HC11 MICROCONTROLLERS
Instruction set addressing modes – operating modes- Interrupt system- RTC-Serial Communication Interface – A/D Converter PWM and UART.

UNIT V PIC MICROCONTROLLER

TOTAL: 45 PERIODS

OUTCOMES:
- The student will be able to work with suitable microprocessor / microcontroller for a specific real world application.

TEXT BOOK:

REFERENCES:

Readings: Web links www.ocw.nit.edu  www.arm.com

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EC6014 COGNITIVE RADIO

OBJECTIVES:
The student should be made to:
- Know the basics of the software defined radios.
- Learn the design of the wireless networks based on the cognitive radios
- Understand the concepts of wireless networks and next generation networks

UNIT I  INTRODUCTION TO SOFTWARE DEFINED RADIO
Definitions and potential benefits, software radio architecture evolution, technology tradeoffs and architecture implications.

UNIT II  SDR ARCHITECTURE
Essential functions of the software radio, basic SDR, hardware architecture, Computational processing resources, software architecture, top level component interfaces, interface topologies among plug and play modules.

UNIT III INTRODUCTION TO COGNITIVE RADIOS
Marking radio self-aware, cognitive techniques – position awareness, environment awareness in cognitive radios, optimization of radio resources, Artificial Intelligence Techniques.

UNIT IV  COGNITIVE RADIO ARCHITECTURE

UNIT V  NEXT GENERATION WIRELESS NETWORKS
The XG Network architecture, spectrum sensing, spectrum management, spectrum mobility, spectrum sharing, upper layer issues, cross – layer design.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, students will be able to
- Describe the basics of the software defined radios.
- Design the wireless networks based on the cognitive radios
- Explain the concepts behind the wireless networks and next generation networks
TEXT BOOKS:

REFERENCES:

EC6015 RADAR AND NAVIGATIONAL AIDS

OBJECTIVES:
- To apply Doppler principle to radars and hence detect moving targets, cluster, also to understand tracking radars
- To refresh principles of antennas and propagation as related to radars, also study of transmitters and receivers.
- To understand principles of navigation, in addition to approach and landing aids as related to navigation

UNIT I INTRODUCTION TO RADAR EQUATION

UNIT II MTI AND PULSE DOPPLER RADAR
Introduction to Doppler and MTI Radar- Delay –Line Cancellers- Staggered Pulse Repetition Frequencies –Doppler Filter Banks - Digital MTI Processing - Moving Target Detector - Limitations to MTI Performance - MTI from a Moving Platform (AMIT) – Pulse Doppler Radar – Other Doppler Radar Topics- Tracking with Radar –Monopulse Tracking –Conical Scan and Sequential Lobing - Limitations
to Tracking Accuracy - Low-Angle Tracking - Tracking in Range - Other Tracking Radar Topics - Comparison of Trackers - Automatic Tracking with Surveillance Radars (ADT).

UNIT III DETECTION OF SIGNALS IN NOISE

Radar Transmitters and Receivers - Introduction - Linear Beam Power Tubes - Solid State RF Power Sources - Magnetron - Crossed Field Amplifiers - Other RF Power Sources - Other aspects of Radar Transmitter - The Radar Receiver - Receiver noise Figure - Super heterodyne Receiver - Duplexers and Receiver Protectors - Radar Displays.

UNIT IV RADIO DIRECTION AND RANGES


UNIT V SATELLITE NAVIGATION SYSTEM

OUTCOMES:
Upon completion of the course, students will be able to:
- Explain principles of navigation, in addition to approach and landing aids as related to navigation
- Derive and discuss the Range equation and the nature of detection.
- Describe about the navigation systems using the satellite.

TEXTBOOKS:

REFERENCES:
OBJECTIVES:

- To understand the basics of solid state physics.
- To understand the basics of display devices.
- To understand the optical detection devices.
- To understand the design of optoelectronic integrated circuits.

UNIT I ELEMENTS OF LIGHT AND SOLID STATE PHYSICS


UNIT II DISPLAY DEVICES AND LASERS


UNIT III OPTICAL DETECTION DEVICES

Photo detector, Thermal detector, Photo Devices, Photo Conductors, Photo diodes, Detector Performance.

UNIT IV OPTOELECTRONIC MODULATOR


UNIT V OPTOELECTRONIC INTEGRATED CIRCUITS

Introduction, hybrid and Monolithic Integration, Application of Opto Electronic Integrated Circuits, Integrated transmitters and Receivers, Guided wave devices.

OUTCOMES:

Upon Completion of the course, the students will be able to

- To design display devices.
- To design optoelectronic detection devices and modulators.
- To design optoelectronic integrated circuits.

TEXTBOOKS:


REFERENCES:

OBJECTIVES:
The student should be made to:
- Be familiar with RF transceiver system design for wireless communications.
- Be exposed to design methods of receivers and transmitters used in communication systems

UNIT I CMOS PHYSICS, TRANSCEIVER SPECIFICATIONS AND ARCHITECTURES 9
Introduction to MOSFET Physics, Noise: Thermal, shot, flicker, popcorn noise, Two port Noise theory, Noise Figure, THD, IP2, IP3, Sensitivity, SFDR, Phase noise - Specification distribution over a communication link, Homodyne Receiver, Heterodyne Receiver, Image reject, Low IF Receiver Architectures Direct up conversion Transmitter, Two step up conversion Transmitter

UNIT II IMPEDANCE MATCHING AND AMPLIFIERS 9
S-parameters with Smith chart, Passive IC components, Impedance matching networks, Common Gate, Common Source Amplifiers, OC Time constants in bandwidth estimation and enhancement, High frequency amplifier design, Power match and Noise match, Single ended and Differential LNAs, Terminated with Resistors and Source Degeneration LNAs.

UNIT III FEEDBACK SYSTEMS AND POWER AMPLIFIERS 9
Stability of feedback systems: Gain and phase margin, Root-locus techniques, Time and Frequency domain considerations, Compensation, General model – Class A, AB, B, C, D, E and F amplifiers, Power amplifier Linearization Techniques, Efficiency boosting techniques, ACPR metric, Design considerations

UNIT IV PLL AND FREQUENCY SYNTHESIZERS 9
Linearised Model, Noise properties, Phase detectors, Loop filters and Charge pumps, Integer-N frequency synthesizers, Direct Digital Frequency synthesizers

UNIT V MIXERS AND OSCILLATORS 9
Mixer characteristics, Non-linear based mixers, Quadratic mixers, Multiplier based mixers, Single balanced and double balanced mixers, sub sampling mixers, Oscillators describing Functions, Colpitts oscillators, Resonators, Tuned Oscillators, Negative resistance oscillators, Phase noise.

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to
- Design RF transceiver systems
- Use the systematic design methods of receivers and transmitters

TEXT BOOKS:

REFERENCES:

CS6003 AD HOC AND SENSOR NETWORKS

OBJECTIVES: The student should be made to:
- Understand the design issues in ad hoc and sensor networks.
- Learn the different types of MAC protocols.
- Be familiar with different types of adhoc routing protocols.
- Be expose to the TCP issues in adhoc networks.
- Learn the architecture and protocols of wireless sensor networks.

UNIT I INTRODUCTION

UNIT II MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS
Issues in designing a MAC Protocol- Classification of MAC Protocols- Contention based protocols- Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms – Multi channel MAC-IEEE 802.11

UNIT III ROUTING PROTOCOLS AND TRANSPORT LAYER IN AD HOC WIRELESS NETWORKS
Issues in designing a routing and Transport Layer protocol for Ad hoc networks- proactive routing, reactive routing (on-demand), hybrid routing- Classification of Transport Layer solutions-TCP over Ad hoc wireless Networks.

UNIT IV WIRELESS SENSOR NETWORKS (WSNS) AND MAC PROTOCOLS
Single node architecture: hardware and software components of a sensor node - WSN Network architecture: typical network architectures-data relaying and aggregation strategies -MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC- IEEE 802.15.4.

UNIT V WSN ROUTING, LOCALIZATION & QOS

OUTCOMES:
Upon completion of the course, the student should be able to:
- Explain the concepts, network architectures and applications of ad hoc and wireless sensor networks
- Analyze the protocol design issues of ad hoc and sensor networks
- Design routing protocols for ad hoc and wireless sensor networks with respect to some protocol design issues
- Evaluate the QoS related performance measurements of ad hoc and sensor networks
TEXT BOOK:

REFERENCES:

GE6082 INDIAN CONSTITUTION AND SOCIETY

OBJECTIVES:
- To know about Indian constitution.
- To know about central and state government functionalities in India.
- To know about Indian society.

UNIT I INTRODUCTION

UNIT II STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT
Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.

UNIT III STRUCTURE AND FUNCTION OF STATE GOVERNMENT

UNIT IV CONSTITUTION FUNCTIONS
Indian Federal System – Center – State Relations – President’s Rule – Constitutional Amendments – Constitutional Functionaries - Assessment of working of the Parliamentary System in India.

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

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, students will be able to:
- Understand the functions of the Indian government
- Understand and abide the rules of the Indian constitution.
- Understand and appreciate different culture among the people.
TEXTBOOKS:

REFERENCES:

EC6018 MULTIMEDIA COMPRESSION AND COMMUNICATION

OBJECTIVES:
- To have a complete understanding of error-control coding.
- To understand encoding and decoding of digital data streams.
- To introduce methods for the generation of these codes and their decoding techniques.
- To have a detailed knowledge of compression and decompression techniques.
- To introduce the concepts of multimedia communication.

UNIT I MULTIMEDIA COMPONENTS
Introduction - Multimedia skills - Multimedia components and their characteristics - Text, sound, images, graphics, animation, video, hardware.

UNIT II AUDIO AND VIDEO COMPRESSION

UNIT III TEXT AND IMAGE COMPRESSION
Compression principles-source encoders and destination encoders-lossless and lossy compression-entropy encoding –source encoding -text compression –static Huffman coding dynamic coding – arithmetic coding –Lempel ziv-welsh Compression-image compression

UNIT IV VOIP TECHNOLOGY
Basics of IP transport, VoIP challenges, H.323/ SIP –Network Architecture, Protocols, Call establishment and release, VoIP and SS7, Quality of Service- CODEC Methods- VOIP applicability

UNIT V MULTIMEDIA NETWORKING
Multimedia networking -Applications-streamed stored and audio-making the best Effort service-protocols for real time interactive Applications-distributing multimedia-beyond best effort service-secluding and policing Mechanisms-integrated services-differentiated Services-RSVP.

TOTAL : 45 PERIODS
OUTCOMES:
Upon Completion of the course, the students will be able to
• Describe various multimedia components
• Describe compression and decompression techniques.
• Apply the compression concepts in multimedia communication.

TEXT BOOK:

REFERENCES:

GE6075
PROFESSIONAL ETHICS IN ENGINEERING

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

UNIT II
ENGINEERING ETHICS

UNIT III
ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV
SAFETY, RESPONSIBILITIES AND RIGHTS
UNIT V GLOBAL ISSUES

TOTAL: 45 PERIODS

OUTCOMES:
- 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

EC6019 DATA CONVERTERS

OBJECTIVES:
- To explain the basic operational and design principles of CMOS Analog to Digital and Digital to Analog converter architectures.
- To introduce the design calculations for developing the various blocks associated with a typical CMOS AD or DA converter.
- To make students decide the dimensions and bias conditions of all the MOS transistors involved in the design.

UNIT I SAMPLE AND HOLD CIRCUITS
Sampling switches, Conventional open loop and closed loop sample and hold architecture, Open loop architecture with miller compensation, multiplexed input architectures, recycling architecture switched capacitor architecture.
UNIT II  SWITCH CAPACITOR CIRCUITS AND COMPARATORS  9
Switched-capacitor amplifiers, switched capacitor integrator, switched capacitor common mode feedback. Single stage amplifier as comparator, cascaded amplifier stages as comparator, latched comparators.

UNIT III  DIGITAL TO ANALOG CONVERSION  9
Performance metrics, reference multiplication and division, switching and logic functions in AC, Resistor ladder DAC architecture, current steering DAC architecture.

UNIT IV  ANALOG TO DIGITAL CONVERSION  9
Performance metric, Flash architecture, Pipelined Architecture, Successive approximation architecture, Time interleaved architecture.

UNIT V  PRECISION TECHNIQUES  9
Comparator offset cancellation, Op Amp offset cancellation, Calibration techniques, range overlap and digital correction.

TOTAL:45 PERIODS

OUTCOMES:
Upon completion of the course, the student should be able to:
- Explain sample and hold circuits
- Design ADC/DAC circuits
- Analyze ADC/DAC Architecture and Performance
- Discuss calibration techniques

TEXT BOOK:

REFERENCES:

CS6701  CRYPTOGRAPHY AND NETWORK SECURITY  L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- Understand OSI security architecture and classical encryption techniques.
- Acquire fundamental knowledge on the concepts of finite fields and number theory.
- Understand various block cipher and stream cipher models.
- Describe the principles of public key cryptosystems, hash functions and digital signature.

UNIT I  INTRODUCTION & NUMBER THEORY  10
UNIT II  BLOCK CIPHERS & PUBLIC KEY CRYPTOGRAPHY

Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)-Triple DES-Blowfish-RC5 algorithm. **Public key cryptography:** Principles of public key cryptosystems-The RSA algorithm-Key management - Diffie Hellman Key exchange-Elliptic curve arithmetic-Elliptic curve cryptography.

UNIT III  HASH FUNCTIONS AND DIGITAL SIGNATURES


UNIT IV  SECURITY PRACTICE & SYSTEM SECURITY


UNIT V  E-MAIL, IP & WEB SECURITY

**E-mail Security:** Security Services for E-mail-attacks possible through E-mail - establishing keys privacy-authentication of the source-Message Integrity-Non-repudiation-Pretty Good Privacy-S/MIME. **IPSecurity:** Overview of IPSec - IP and IPv6-Authentication Header-Encapsulation Security Payload (ESP)-Internet Key Exchange (Phases of IKE, ISAKMP/IKE Encoding). **Web Security:** SSL/TLS Basic Protocol-computing the keys- client authentication-PKI as deployed by SSLAttacks fixed in v3-Exportability-Encoding-Secure Electronic Transaction (SET).

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students should be able to:
- Compare various Cryptographic Techniques
- Design Secure applications
- Inject secure coding in the developed applications

TEXT BOOKS:

REFERENCES:
OBJECTIVE:

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

UNIT I  INTRODUCTION


UNIT II  TQM PRINCIPLES

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

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT IV  TQM TOOLS AND TECHNIQUES II


UNIT V  QUALITY SYSTEMS


OUTCOMES:

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

TEXTBOOK:


REFERENCES:

OBJECTIVE:
- To develop and strengthen entrepreneurial quality and motivation in students and to impart basic entrepreneurial skills and understanding to run a business efficiently and effectively.

UNIT I  ENTREPRENEURSHIP  

UNIT II  MOTIVATION  
Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.

UNIT III  BUSINESS  

UNIT IV  FINANCING AND ACCOUNTING  

UNIT V  SUPPORT TO ENTREPRENEURS  

TOTAL : 45 PERIODS

OUTCOMES:
- Upon completion of the course, students will be able to gain knowledge and skills needed to run a business successfully.

TEXTBOOKS:

REFERENCES:
OBJECTIVES:
- To outline the need for Software Project Management
- To highlight different techniques for software cost estimation and activity planning.

UNIT I PROJECT EVALUATION AND PROJECT PLANNING

UNIT II PROJECT LIFE CYCLE AND EFFORT ESTIMATION

UNIT III ACTIVITY PLANNING AND RISK MANAGEMENT

UNIT IV PROJECT MANAGEMENT AND CONTROL

UNIT V STAFFING IN SOFTWARE PROJECTS

OUTCOMES:
- At the end of the course the students will be able to practice Project Management principles while developing a software.

TEXTBOOK:

REFERENCES:
ANNA UNIVERSITY, CHENNAI  
AFFILIATED INSTITUTIONS  
R-2013  
B.E. COMPUTER SCIENCE AND ENGINEERING  
I TO VIII SEMESTER CURRICULUM AND SYLLABUS

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### SEMESTER VI

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**TOTAL NO. OF CREDITS: 184**

**LIST OF ELECTIVES**

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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
- Project
- Assignment
- Reviews
- Creative writing
- Poster making, etc.

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

UNIT II SEQUENCES AND SERIES
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

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.

TEXT BOOKS:

REFERENCES:

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
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

UNIT III QUANTUM PHYSICS

UNIT IV ACOUSTICS AND ULTRASONICS
Production of ultrasonics 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
Spontaneous and stimulated emission- Population inversion -Einstein’s A and B coefficients - derivation. Types of lasers – Nd:YAG, CO₂ , Semiconductor lasers (homojunction & heterojunction)-
Industrial and Medical Applications.
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

TEXT BOOKS:

REFERENCES:
1. Searls and Zemansky. University Physics, 2009
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 polydispersity 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 isochore (problems).

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY


UNIT IV PHASE RULE AND ALLOYS


UNIT V NANOCHEMISTRY

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, electrodeposition, 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.

TEXT BOOKS:

REFERENCES:

GE6151 COMPUTER PROGRAMMING

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:

GE6152 ENGINEERING GRAPHICS

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  5+ 9
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  5+9
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  5+9
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  6+9
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)  3
Introduction to drafting packages and demonstration of their use.

TOTAL:75 PERIODS

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.

TEXT BOOK:

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:
1. Search, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions – Includes Parameter Passing
9. Program using Recursive Function and conversion from given program to flow chart.
10. 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 EQUIPMENT FOR A BATCH OF 30 STUDENTS:
Standalone desktops with C compiler 30 Nos.
(or)
Server with C compiler supporting 30 terminals or more.
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 9

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 13

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 10
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 13
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.

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

REFERENCES:

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

LIST OF EXPERIMENTS
(Any FIVE Experiments)

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.

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
6. (1,10- phenanthroline / thiocyanate method)
7. Determination of molecular weight of polyvinylalcohol using Ostwald viscometer
8. Conductometric titration of strong acid vs strong base

TOTAL: 30 PERIODS

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
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
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
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
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.

TOTAL: 60 PERIODS

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%

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**  9+3

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**  9+3


UNIT IV  **ANALYTIC FUNCTIONS**  9+3

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**  9+3

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: 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.

**TEXT BOOKS:**


**REFERENCES:**

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

UNIT IV DIELECTRIC MATERIALS

UNIT V ADVANCED ENGINEERING MATERIALS

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.

TEXT BOOKS:

REFERENCES:
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, windmills 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 9

UNIT III ENERGY SOURCES 9
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- battery- lithium battery- fuel cell H₂-O₂ fuel cell- applications.

UNIT IV ENGINEERING MATERIALS 9
Abrasives: definition, classification or types, grinding wheel, abrasive paper and cloth. Refractories: definition, characteristics, classification, properties - refactororiness 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 9

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.

TEXT BOOKS:

REFERENCES:

CS6201 DIGITAL PRINCIPLES AND SYSTEM DESIGN L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- Learn the various number systems.
- Learn Boolean Algebra
- Understand the various logic gates.
- Be familiar with various combinational circuits.
- Be familiar with designing synchronous and asynchronous sequential circuits.
- Be exposed to designing using PLD

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES
9

UNIT II COMBINATIONAL LOGIC
9

UNIT III SYNCHRONOUS SEQUENTIAL LOGIC
9

UNIT IV ASYNCHRONOUS SEQUENTIAL LOGIC
9
UNIT V MEMORANDUM AND PROGRAMMABLE LOGIC 9

TOTAL: 45 PERIODS

OUTCOMES:
At the end of this course, the student will be able to:
- Perform arithmetic operations in any number system.
- Simplify the Boolean expression using K-Map and Tabulation techniques.
- Use boolean simplification techniques to design a combinational hardware circuit.
- Design and Analysis of a given digital circuit – combinational and sequential.
- Design using PLD.

TEXT BOOK:

REFERENCES:

CS6202 PROGRAMMING AND DATA STRUCTURES I L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- Be familiar with the basics of C programming language.
- Be exposed to the concepts of ADTs
- Learn linear data structures – list, stack, and queue.
- Be exposed to sorting, searching, hashing algorithms

UNIT I C PROGRAMMING FUNDAMENTALS- A REVIEW 9
Conditional statements – Control statements – Functions – Arrays – Preprocessor - Pointers - Variation in pointer declarations – Function Pointers – Function with Variable number of arguments

UNIT II C PROGRAMMING ADVANCED FEATURES 9
Structures and Unions - File handling concepts – File read – write – binary and Stdio - File Manipulations

UNIT III LINEAR DATA STRUCTURES – LIST 9
Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation — singly linked lists- circularly linked lists- doubly-linked lists – applications of lists –Polynomial Manipulation – All operation (Insertion, Deletion, Merge, Traversal)
UNIT IV  LINEAR DATA STRUCTURES – STACKS, QUEUES  
Stack ADT – Evaluating arithmetic expressions- other applications- Queue ADT – circular queue implementation – Double ended Queues – applications of queues

UNIT V  SORTING, SEARCHING AND HASH TECHNIQUES  

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Use the control structures of C appropriately for problems.
- Implement abstract data types for linear data structures.
- Apply the different linear data structures to problem solutions.
- Critically analyse the various algorithms.

TEXT BOOKS:

REFERENCES:

GE6262  PHYSICS AND CHEMISTRY LABORATORY – II  
L T P C 
0 0 2 1

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

(Any FIVE Experiments)

LIST OF 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.

(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 iron content of the given solution using potentiometer
6. Estimation of sodium present in water using flame photometer
7. Corrosion experiment – weight loss method
8. 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)
OBJECTIVES:
The student should be made to:
- Understand the various logic gates.
- Be familiar with various combinational circuits.
- Understand the various components used in the design of digital computers.
- Be exposed to sequential circuits
- Learn to use HDL

ST OF EXPERIMENTS:
1. Verification of Boolean Theorems using basic gates.
2. Design and implementation of combinational circuits using basic gates for arbitrary functions, code converters.
3. Design and implementation of combinational circuits using MSI devices:
   - 4 – bit binary adder / subtractor
   - Parity generator / checker
   - Magnitude Comparator
   - Application using multiplexers
4. Design and implementation of sequential circuits:
   - Shift –registers
   - Synchronous and asynchronous counters
5. Coding combinational / sequential circuits using HDL.
6. Design and implementation of a simple digital system (Mini Project).

TOTAL: 45 PERIODS

OUTCOMES:
At the end of this course, the student will be able to:
- Use boolean simplification techniques to design a combinational hardware circuit.
- Design and Implement combinational and sequential circuits.
- Analyze a given digital circuit – combinational and sequential.
- Design the different functional units in a digital computer system.
- Design and Implement a simple digital system.

LABORATORY REQUIREMENT FOR BATCH OF 30 STUDENTS
HARDWARE:
1. Digital trainer kits 30
2. Digital ICs required for the experiments in sufficient numbers 96

SOFTWARE:
1. HDL simulator.
OBJECTIVES:
The students should be made to:
- Be familiar with c programming
- Be exposed to implementing abstract data types
- Learn to use files
- Learn to implement sorting and searching algorithms.

1. C Programs using Conditional and Control Statements
2. C Programs using Arrays, Strings and Pointers and Functions
3. Representation of records using Structures in C – Creation of Linked List – Manipulation of records in a Linked List
4. File Handling in C – Sequential access – Random Access
5. Operations on a Stack and Queue – infix to postfix – simple expression evaluation using stacks - Linked Stack Implementation – Linked Queue Implementation
6. Implementation of Sorting algorithms
7. Implementation of Linear search and Binary Search.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Design and implement C programs for implementing stacks, queues, linked lists.
- Apply good programming design methods for program development.
- Apply the different data structures for implementing solutions to practical problems.
- Develop searching and sorting programs.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
Standalone desktops with C compiler 30 Nos.
(or)
Server with C compiler supporting 30 terminals or more.

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  9+3

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

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:
OBJECTIVES:
The student should be made to:
- Be familiar with the C++ concepts of abstraction, encapsulation, constructor, polymorphism, overloading and Inheritance.
- Learn advanced nonlinear data structures.
- Be exposed to graph algorithms
- Learn to apply Tree and Graph structures

UNIT I  OBJECT ORIENTED PROGRAMMING FUNDAMENTALS  9
C++ Programming features - Data Abstraction - Encapsulation - class - object - constructors - static members – constant members – member functions – pointers – references - Role of this pointer – Storage classes – function as arguments.

UNIT II  OBJECT ORIENTED PROGRAMMING CONCEPTS  9

UNIT III  C++ PROGRAMMING ADVANCED FEATURES  9

UNIT IV  ADVANCED NON-LINEAR DATA STRUCTURES  9

UNIT V  GRAPHS  9

OUTCOMES:
At the end of the course, the student should be able to:
- Design problem solutions using Object Oriented Techniques.
- Apply the concepts of data abstraction, encapsulation and inheritance for problem solutions.
- Use the control structures of C++ appropriately.
- Critically analyse the various algorithms.
- Apply the different data structures to problem solutions.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To expose the students to the fundamentals of Database Management Systems.
- To make the students understand the relational model.
- To familiarize the students with ER diagrams.
- To expose the students to SQL.
- To make the students to understand the fundamentals of Transaction Processing and Query Processing.
- To familiarize the students with the different types of databases.
- To make the students understand the Security Issues in Databases.

UNIT I  INTRODUCTION TO DBMS

File Systems Organization - Sequential, Pointer, Indexed, Direct - Purpose of Database System- Database System Terminologies-Database characteristics- Data models – Types of data models – Components of DBMS- Relational Algebra. LOGICAL DATABASE DESIGN: Relational DBMS - Codd's Rule - Entity-Relationship model - Extended ER Normalization – Functional Dependencies, Anomaly- 1NF to 5NF- Domain Key Normal Form – Denormalization

UNIT II  SQL & QUERY OPTIMIZATION


UNIT III  TRANSACTION PROCESSING AND CONCURRENCY CONTROL


UNIT IV  TRENDS IN DATABASE TECHNOLOGY


UNIT V  ADVANCED TOPICS

DATABASE SECURITY: Data Classification-Threats and risks – Database access Control – Types of Privileges –Cryptography- Statistical Databases.- Distributed Databases-Architecture-Transaction Processing-Data Warehousing and Mining-Classification-Association rules-Clustering-Information Retrieval- Relevance ranking-Crawling and Indexing the Web- Object Oriented Databases-XML Databases.

OUTCOMES:

At the end of the course, the student should be able to:
- Design Databases for applications.
- Use the Relational model, ER diagrams.
- Apply concurrency control and recovery mechanisms for practical problems.
- Design the Query Processor and Transaction Processor.
- Apply security concepts to databases.

TOTAL: 45 PERIODS
TEXT BOOK:

REFERENCES:

CS6303 COMPUTER ARCHITECTURE

OBJECTIVES:
- To make students understand the basic structure and operation of digital computer.
- To understand the hardware-software interface.
- To familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations.
- To expose the students to the concept of pipelining.
- To familiarize the students with hierarchical memory system including cache memories and virtual memory.
- To expose the students with different ways of communicating with I/O devices and standard I/O interfaces.

UNIT I OVERVIEW & INSTRUCTIONS

UNIT II ARITHMETIC OPERATIONS
ALU - Addition and subtraction – Multiplication – Division – Floating Point operations – Subword parallelism.

UNIT III PROCESSOR AND CONTROL UNIT
Basic MIPS implementation – Building datapath – Control Implementation scheme – Pipelining – Pipelined datapath and control – Handling Data hazards & Control hazards – Exceptions.

UNIT IV PARALLELISM
Instruction-level-parallelism – Parallel processing challenges – Flynn’s classification – Hardware multithreading – Multicore processors
UNIT V MEMORY AND I/O SYSTEMS
Memory hierarchy - Memory technologies – Cache basics – Measuring and improving cache performance - Virtual memory, TLBs - Input/output system, programmed I/O, DMA and interrupts, I/O processors.

OUTCOMES:
At the end of the course, the student should be able to:
- Design arithmetic and logic unit.
- Design and analyze pipelined control units
- Evaluate performance of memory systems.
- Understand parallel processing architectures.

TEXT BOOK:

REFERENCES:

CS6304 ANALOG AND DIGITAL COMMUNICATION

OBJECTIVES:
The student should be made to:
- Understand analog and digital communication techniques.
- Learn data and pulse communication techniques.
- Be familiarized with source and Error control coding.
- Gain knowledge on multi-user radio communication.

UNIT I ANALOG COMMUNICATION
UNIT II DIGITAL COMMUNICATION

UNIT III DATA AND PULSE COMMUNICATION
Data Communication: History of Data Communication - Standards Organizations for Data Communication- Data Communication Circuits - Data Communication Codes - Error Detection and Correction Techniques - Data communication Hardware - serial and parallel interfaces.

UNIT IV SOURCE AND ERROR CONTROL CODING
Entropy, Source encoding theorem, Shannon fano coding, Huffman coding, mutual information, channel capacity, channel coding theorem, Error Control Coding, linear block codes, cyclic codes, convolution codes, viterbi decoding algorithm.

UNIT V MULTI-USER RADIO COMMUNICATION
Advanced Mobile Phone System (AMPS) - Global System for Mobile Communications (GSM) - Code division multiple access (CDMA) – Cellular Concept and Frequency Reuse - Channel Assignment and Hand - Overview of Multiple Access Schemes - Satellite Communication - Bluetooth.

OUTCOMES:
At the end of the course, the student should be able to:
- Apply analog and digital communication techniques.
- Use data and pulse communication techniques.
- Analyze Source and Error control coding.
- Utilize multi-user radio communication.

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:
OBJECTIVES:
To the study of nature and the facts about environment.
- To find and implement 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 12
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 10
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 10
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and 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
Field study of local area to document environmental assets – river/forest/grassland/hill/mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT

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 environment at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions.
- Development and improvement in standard of living has lead to serious environmental disasters.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
The student should be made to:
- Be familiarized with good programming design methods, particularly Top-Down design.
- Getting exposure in implementing the different data structures using C++
- Appreciate recursive algorithms.

LIST OF EXPERIMENTS:
IMPLEMENTATION IN THE FOLLOWING TOPICS:
1. Constructors & Destructors, Copy Constructor.
2. Friend Function & Friend Class.
3. Inheritance.
4. Polymorphism & Function Overloading.
5. Virtual Functions.
6. Overload Unary & Binary Operators Both as Member Function & Non Member Function.
7. Class Templates & Function Templates.
8. Exception Handling Mechanism.
10. File Stream classes.
11. Applications of Stack and Queue
12. Binary Search Tree
13. Tree traversal Techniques
14. Minimum Spanning Trees
15. Shortest Path Algorithms

OUTCOMES:
At the end of the course, the student should be able to:
- Design and implement C++ programs for manipulating stacks, queues, linked lists, trees, and graphs.
- Apply good programming design methods for program development.
- Apply the different data structures for implementing solutions to practical problems.
- Develop recursive programs using trees and graphs.

REFERENCE:
spoken-tutorial.org.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
Standalone desktops with C++ compiler 30 Nos.
(or)
Server with C++ compiler supporting 30 terminals or more.
OBJECTIVES:
The student should be made to:
- Learn to create and use a database
- Be familiarized with a query language
- Have hands on experience on DDL Commands
- Have a good understanding of DML Commands and DCL commands
- Familiarize advanced SQL queries.
- Be Exposed to different applications

LIST OF EXPERIMENTS:
1. Creation of a database and writing SQL queries to retrieve information from the database.
2. Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.
3. Creation of Views, Synonyms, Sequence, Indexes, Save point.
4. Creating an Employee database to set various constraints.
5. Creating relationship between the databases.
7. Write a PL/SQL block to satisfy some conditions by accepting input from the user.
8. Write a PL/SQL block that handles all types of exceptions.
10. Creation of database triggers and functions
11. Mini project (Application Development using Oracle/ Mysql )
   a) Inventory Control System.
   b) Material Requirement Processing.
   c) Hospital Management System.
   d) Railway Reservation System.
   e) Personal Information System.
   f) Web Based User Identification System.
   g) Timetable Management System.
   h) Hotel Management System

OUTCOMES:
At the end of the course, the student should be able to:
- Design and implement a database schema for a given problem-domain
- Populate and query a database
- Create and maintain tables using PL/SQL.
- Prepare reports.

REFERENCE:
spoken-tutorial.org

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

HARDWARE:
Standalone desktops 30 Nos.
(or)
Server supporting 30 terminals or more.
SOFTWARE:
Front end:  VB/VC ++/JAVA or Equivalent
Back end:  Oracle / SQL / MySQL/ PostGress / DB2 or Equivalent

MA 6453  PROBABILITY AND QUEUEING THEORY

OBJECTIVE:
To provide the required mathematical support in real life problems and develop probabilistic models which can be used in several areas of science and engineering.

UNIT I  RANDOM VARIABLES
Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions.

UNIT II  TWO-DIMENSIONAL RANDOM VARIABLES
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables.

UNIT III  RANDOM PROCESSES

UNIT IV  QUEUING MODELS
Markovian queues – Birth and Death processes – Single and multiple server queueing models – Little’s formula - Queues with finite waiting rooms – Queues with impatient customers: Balking and reneging.

UNIT V  ADVANCED QUEUING MODELS
Finite source models - M/G/1 queue – Pollaczeck Khinchin formula - M/D/1 and M/E_k/1 as special cases – Series queues – Open Jackson networks.

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

OUTCOMES:
- The students will have a fundamental knowledge of the probability concepts.
- Acquire skills in analyzing queueing models.
- It also helps to understand and characterize phenomenon which evolve with respect to time in a probabilistic manner.

TEXT BOOKS:

REFERENCES:

CS6551 COMPUTER NETWORKS

OBJECTIVES:
The student should be made to:
- Understand the division of network functionalities into layers.
- Be familiar with the components required to build different types of networks
- Be exposed to the required functionality at each layer
- Learn the flow control and congestion control algorithms

UNIT I FUNDAMENTALS & LINK LAYER
Building a network – Requirements - Layering and protocols - Internet Architecture – Network software – Performance ; Link layer Services - Framing - Error Detection - Flow control

UNIT II MEDIA ACCESS & INTERNETWORKING
Media access control - Ethernet (802.3) - Wireless LANs – 802.11 – Bluetooth - Switching and bridging – Basic Internetworking (IP, CIDR, ARP, DHCP,ICMP )

UNIT III ROUTING
Routing (RIP, OSPF, metrics) – Switch basics – Global Internet (Areas, BGP, IPv6), Multicast – addresses – multicast routing (DVMRP, PIM)

UNIT IV TRANSPORT LAYER
Overview of Transport layer - UDP - Reliable byte stream (TCP) - Connection management - Flow control - Retransmission – TCP Congestion control - Congestion avoidance (DECbit, RED) – QoS – Application requirements

UNIT V APPLICATION LAYER
Traditional applications -Electronic Mail (SMTP, POP3, IMAP, MIME) – HTTP – Web Services – DNS - SNMP

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Identify the components required to build different types of networks
- Choose the required functionality at each layer for given application
- Identify solution for each functionality at each layer
- Trace the flow of information from one node to another node in the network

TEXT BOOK:
REFERENCES:

CS6401 OPERATING SYSTEMS

OBJECTIVES:
The student should be made to:
- Study the basic concepts and functions of operating systems.
- Understand the structure and functions of OS.
- Learn about Processes, Threads and Scheduling algorithms.
- Understand the principles of concurrency and Deadlocks.
- Learn various memory management schemes.
- Study I/O management and File systems.
- Learn the basics of Linux system and perform administrative tasks on Linux Servers.

UNIT I OPERATING SYSTEMS OVERVIEW

UNIT II PROCESS MANAGEMENT

UNIT III STORAGE MANAGEMENT
Main Memory-Contiguous Memory Allocation, Segmentation, Paging, 32 and 64 bit architecture Examples; Virtual Memory- Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory, OS Examples.

UNIT IV I/O SYSTEMS

UNIT V CASE STUDY
Linux System- Basic Concepts;System Administration-Requirements for Linux System Administrator, Setting up a LINUX Multifunction Server, Domain Name System, Setting Up Local Network Services; Virtualization- Basic Concepts, Setting Up Xen,VMware on Linux Host and Adding Guest OS.

TOTAL: 45 PERIODS
OUTCOMES:
At the end of the course, the student should be able to:
- Design various Scheduling algorithms.
- Apply the principles of concurrency.
- Design deadlock, prevention and avoidance algorithms.
- Compare and contrast various memory management schemes.
- Design and Implement a prototype file systems.
- Perform administrative tasks on Linux Servers.

TEXT BOOK:

REFERENCES:
5. http://nptel.ac.in/.  

CS6402 DESIGN AND ANALYSIS OF ALGORITHMS L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- Learn the algorithm analysis techniques.
- Become familiar with the different algorithm design techniques.
- Understand the limitations of Algorithm power.

UNIT I INTRODUCTION 9

UNIT II BRUTE FORCE AND DIVIDE-AND-CONQUER 9

UNIT III DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE 9
UNIT IV  ITERATIVE IMPROVEMENT  9

UNIT V  COPING WITH THE LIMITATIONS OF ALGORITHM POWER  9

OUTCOMES:
At the end of the course, the student should be able to:
- Design algorithms for various computing problems.
- Analyze the time and space complexity of algorithms.
- Critically analyze the different algorithm design techniques for a given problem.
- Modify existing algorithms to improve efficiency.

TEXT BOOK:

REFERENCES:
4. http://nptel.ac.in/

EC6504      MICROPROCESSOR AND MICROCONTROLLER      L T P C 3 0 0 3

OBJECTIVES:
The student should be made to:
- Study the Architecture of 8086 microprocessor.
- Learn the design aspects of I/O and Memory Interfacing circuits.
- Study about communication and bus interfacing.
- Study the Architecture of 8051 microcontroller.

UNIT I  THE 8086 MICROPROCESSOR  9
Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.
UNIT II  8086 SYSTEM BUS STRUCTURE

UNIT III  I/O INTERFACING

UNIT IV  MICROCONTROLLER
Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

UNIT V  INTERFACING MICROCONTROLLER

OUTCOMES:
At the end of the course, the student should be able to:
- Design and implement programs on 8086 microprocessor.
- Design I/O circuits.
- Design Memory Interfacing circuits.
- Design and implement 8051 microcontroller based systems.

TEXT BOOKS:

REFERENCE:
1. Doughlas V.Hall, “Microprocessors and Interfacing, Programming and Hardware”, TMH, 2012

CS6403 SOFTWARE ENGINEERING  L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- Understand the phases in a software project
- Understand fundamental concepts of requirements engineering and Analysis Modelling.
- Understand the major considerations for enterprise integration and deployment.
- Learn various testing and maintenance measures
UNIT I SOFTWARE PROCESS AND PROJECT MANAGEMENT 9

UNIT II REQUIREMENTS ANALYSIS AND SPECIFICATION 9

UNIT III SOFTWARE DESIGN 9

UNIT IV TESTING AND IMPLEMENTATION 9

UNIT V PROJECT MANAGEMENT 9

OUTCOMES:
At the end of the course, the student should be able to
- Identify the key activities in managing a software project.
- Compare different process models.
- Concepts of requirements engineering and Analysis Modeling.
- Apply systematic procedure for software design and deployment.
- Compare and contrast the various testing and maintenance.

TEXT BOOK:

REFERENCES:
OBJECTIVES:
The student should be made to:
- Learn socket programming.
- Be familiar with simulation tools.
- Have hands on experience on various networking protocols.

LIST OF EXPERIMENTS:
1. Implementation of Stop and Wait Protocol and Sliding Window Protocol.
2. Study of Socket Programming and Client – Server model
3. Write a code simulating ARP /RARP protocols.
4. Write a code simulating PING and TRACEROUTE commands
5. Create a socket for HTTP for web page upload and download.
6. Write a program to implement RPC (Remote Procedure Call)
7. Implementation of Subnetting .
8. Applications using TCP Sockets like
   a. Echo client and echo server
   b. Chat
   c. File Transfer
9. Applications using TCP and UDP Sockets like
   d. DNS
   e. SNMP
   f. File Transfer
10. Study of Network simulator (NS).and Simulation of Congestion Control Algorithms using NS
11. Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer:
   i. Link State routing
   ii. Flooding
   iii. Distance vector

TOTAL: 45 PERIODS

REFERENCE:
spoken-tutorial.org.

OUTCOMES:
At the end of the course, the student should be able to
- Use simulation tools
- Implement the various protocols.
- Analyse the performance of the protocols in different layers.
- Analyze various routing algorithms

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

SOFTWARE:
- C / C++ / Java / Equivalent Compiler 30
- Network simulator like NS2/Glomosim/OPNET/
  Equivalent

HARDWARE:
- Standalone desktops 30 Nos
OBJECTIVES:
The student should be made to:
- Introduce ALP concepts and features
- Write ALP for arithmetic and logical operations in 8086 and 8051
- Differentiate Serial and Parallel Interface
- Interface different I/Os with Microprocessors
- Be familiar with MASM

LIST OF EXPERIMENTS:
8086 Programs using kits and MASM
1. Basic arithmetic and Logical operations
2. Move a data block without overlap
3. Code conversion, decimal arithmetic and Matrix operations.
4. Floating point operations, string manipulations, sorting and searching
5. Password checking, Print RAM size and system date
6. Counters and Time Delay

Peripherals and Interfacing Experiments
7. Traffic light control
8. Stepper motor control
9. Digital clock
10. Key board and Display
11. Printer status
12. Serial interface and Parallel interface
13. A/D and D/A interface and Waveform Generation

8051 Experiments using kits and MASM
14. Basic arithmetic and Logical operations
15. Square and Cube program, Find 2’s complement of a number
16. Unpacked BCD to ASCII

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Write ALP Programmes for fixed and Floating Point and Arithmetic
- Interface different I/Os with processor
- Generate waveforms using Microprocessors
- Execute Programs in 8051
- Explain the difference between simulator and Emulator

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:
HARDWARE:
- 8086 development kits - 30 nos
- Interfacing Units - Each 10 nos
- Microcontroller - 30 nos

SOFTWARE:
- Intel Desktop Systems with MASM - 30 nos
- 8086 Assembler
- 8051 Cross Assembler
OBJECTIVES:
The student should be made to:
- Learn shell programming and the use of filters in the UNIX environment.
- Be exposed to programming in C using system calls.
- Learn to use the file system related system calls.
- Be exposed to process creation and inter process communication.
- Be familiar with implementation of CPU Scheduling Algorithms, page replacement algorithms
  and Deadlock avoidance

LIST OF EXPERIMENTS:
2. Shell Programming.
3. Implement the following CPU scheduling algorithms
   a) Round Robin b) SJF c) FCFS d) Priority
4. Implement all file allocation strategies
   a) Sequential b) Indexed c) Linked
5. Implement Semaphores
6. Implement all File Organization Techniques
   a) Single level directory b) Two level c) Hierarchical d) DAG
7. Implement Bankers Algorithm for Dead Lock Avoidance
8. Implement an Algorithm for Dead Lock Detection
9. Implement all page replacement algorithms
   a) FIFO b) LRU c) LFU
10. Implement Shared memory and IPC
11. Implement Paging Technique of memory management.
12. Implement Threading & Synchronization Applications

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to
- Implement deadlock avoidance, and Detection Algorithms
- Compare the performance of various CPU Scheduling Algorithm
- Critically analyze the performance of the various page replacement algorithms
- Create processes and implement IPC

REFERENCE:
spoken-tutorial.org

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
Standalone desktops with C / C++ / Java / Equivalent compiler 30 Nos.

(or)

Server with C / C++ / Java / Equivalent compiler supporting 30 terminals
OBJECTIVES:
To extend student’s Logical and Mathematical maturity and ability to deal with abstraction and to introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.

UNIT I LOGIC AND PROOFS 9+3

UNIT II COMBINATORICS 9+3

UNIT III GRAPHS 9+3
Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths.

UNIT IV ALGEBRAIC STRUCTURES 9+3

UNIT V LATTICES AND BOOLEAN ALGEBRA 9+3

OUTCOMES:
At the end of the course, students would:
- Have knowledge of the concepts needed to test the logic of a program.
- Have an understanding in identifying structures on many levels.
- Be aware of a class of functions which transform a finite set into another finite set which relates to input and output functions in computer science.
- Be aware of the counting principles.
- Be exposed to concepts and properties of algebraic structures such as groups, rings and fields.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
The student should be made to:
- Learn Java Programming.
- Understand different Internet Technologies.
- Be exposed to java specific web services architecture.

UNIT I — JAVA PROGRAMMING

UNIT II — WEBSITES BASICS, HTML 5, CSS 3, WEB 2.0
Web 2.0: Basics-RIA Rich Internet Applications - Collaborations tools - Understanding websites and web servers: Understanding Internet – Difference between websites and web server- Internet technologies Overview –Understanding the difference between internet and intranet; HTML and CSS: HTML 5.0 , XHTML, CSS 3.

UNIT III — CLIENT SIDE AND SERVER SIDE PROGRAMMING

UNIT IV — PHP and XML

UNIT V — INTRODUCTION TO AJAX and WEB SERVICES

OUTCOMES:
At the end of the course, the student should be able to:
- Implement Java programs.
- Create a basic website using HTML and Cascading Style Sheets.
- Design and implement dynamic web page with validation using JavaScript objects and by applying different event handling mechanisms.
- Design rich client presentation using AJAX.
- Design and implement simple web page in PHP, and to present data in XML format.
- Design and implement server side programs using Servlets and JSP.
TEXT BOOKS:

REFERENCES:

CS6502 OBJECT ORIENTED ANALYSIS AND DESIGN L T P C 3 0 0 3

OBJECTIVES:
The student should be made to:
- Learn the basics of OO analysis and design skills.
- Learn the UML design diagrams.
- Learn to map design to code.
- Be exposed to the various testing techniques.

UNIT I UML DIAGRAMS 9

UNIT II DESIGN PATTERNS 9

UNIT III CASE STUDY 9
Case study – the Next Gen POS system, Inception -Use case Modeling - Relating Use cases – include, extend and generalization - Elaboration - Domain Models - Finding conceptual classes and description classes – Associations – Attributes – Domain model refinement – Finding conceptual class Hierarchies - Aggregation and Composition.

UNIT IV APPLYING DESIGN PATTERNS 9
System sequence diagrams - Relationship between sequence diagrams and use cases Logical architecture and UML package diagram – Logical architecture refinement - UML class diagrams - UML interaction diagrams - Applying GoF design patterns.

UNIT V CODING AND TESTING 9

TOTAL: 45 PERIODS
OUTCOMES:
At the end of the course, the student should be able to:
• Design and implement projects using OO concepts.
• Use the UML analysis and design diagrams.
• Apply appropriate design patterns.
• Create code from design.
• Compare and contrast various testing techniques.

TEXT BOOK:

REFERENCES:

CS6503 THEORY OF COMPUTATION L T P C 3 0 0 3

OBJECTIVES:
The student should be made to:
• Understand various Computing models like Finite State Machine, Pushdown Automata, and Turing Machine.
• Be aware of Decidability and Un-decidability of various problems.
• Learn types of grammars.

UNIT I FINITE AUTOMATA

UNIT II GRAMMARS

UNIT III PUSHDOWN AUTOMATA
UNIT IV TURING MACHINES
Definitions of Turing machines – Models – Computable languages and functions – Techniques for Turing machine construction – Multi head and Multi tape Turing Machines - The Halting problem – Partial Solvability – Problems about Turing machine- Chomskian hierarchy of languages.

UNIT V UNSOLVABLE PROBLEMS AND COMPUTABLE FUNCTIONS
Unsolvable Problems and Computable Functions – Primitive recursive functions – Recursive and recursively enumerable languages – Universal Turing machine. MEASURING AND CLASSIFYING COMPLEXITY: Tractable and Intractable problems - Tractable and possibly intractable problems - P and NP completeness - Polynomial time reductions.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• Design Finite State Machine, Pushdown Automata, and Turing Machine.
• Explain the Decidability or Undecidability of various problems

TEXT BOOKS:

REFERENCES:

CS6504 COMPUTER GRAPHICS

OBJECTIVES:
The student should be made to:
• Gain knowledge about graphics hardware devices and software used.
• Understand the two dimensional graphics and their transformations.
• Understand the three dimensional graphics and their transformations.
• Appreciate illumination and color models.
• Be familiar with understand clipping techniques.

UNIT I INTRODUCTION
Survey of computer graphics, Overview of graphics systems – Video display devices, Raster scan systems, Random scan systems, Graphics monitors and Workstations, Input devices, Hard copy Devices, Graphics Software; Output primitives – points and lines, line drawing algorithms, loading the frame buffer, line function; circle and ellipse generating algorithms; Pixel addressing and object geometry, filled area primitives.
UNIT II  TWO DIMENSIONAL GRAPHICS  
Two dimensional geometric transformations – Matrix representations and homogeneous coordinates, composite transformations; Two dimensional viewing – viewing pipeline, viewing coordinate reference frame; widow-to-viewport coordinate transformation, Two dimensional viewing functions; clipping operations – point, line, and polygon clipping algorithms.

UNIT III  THREE DIMENSIONAL GRAPHICS  
Three dimensional concepts; Three dimensional object representations – Polygon surfaces- Polygon tables- Plane equations - Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations – Bezier curves and surfaces -B-Spline curves and surfaces. 

TRANSFORMATION AND VIEWING: Three dimensional geometric and modeling transformations – Translation, Rotation, Scaling, composite transformations; Three dimensional viewing – viewing pipeline, viewing coordinates, Projections, Clipping; Visible surface detection methods.

UNIT IV  ILLUMINATION AND COLOUR MODELS  
Light sources - basic illumination models – halftone patterns and dithering techniques; Properties of light - Standard primaries and chromaticity diagram; Intuitive colour concepts - RGB colour model - YIQ colour model - CMY colour model - HSV colour model - HLS colour model; Colour selection.

UNIT V  ANIMATIONS & REALISM  

TOTAL: 45 PERIODS

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

- Design two dimensional graphics.
- Apply two dimensional transformations.
- Design three dimensional graphics.
- Apply three dimensional transformations.
- Apply Illumination and color models.
- Apply clipping techniques to graphics.
- Design animation sequences.

TEXT BOOKS:

REFERENCES:
6. http://nptel.ac.in/
OBJECTIVES:
The student should be made to:
- Learn the basics of OO analysis and design skills.
- Be exposed to the UML design diagrams.
- Learn to map design to code.
- Be familiar with the various testing techniques

LIST OF EXPERIMENTS:
To develop a mini-project by following the 9 exercises listed below.
1. To develop a problem statement.
2. Identify Use Cases and develop the Use Case model.
3. Identify the conceptual classes and develop a domain model with UML Class diagram.
4. Using the identified scenarios, find the interaction between objects and represent them using UML Sequence diagrams.
5. Draw relevant state charts and activity diagrams.
6. Identify the User Interface, Domain objects, and Technical services. Draw the partial layered, logical architecture diagram with UML package diagram notation.
7. Develop and test the Technical services layer.
8. Develop and test the Domain objects layer.
9. Develop and test the User interface layer.

SUGGESTED DOMAINS FOR MINI-PROJECT:
1. Passport automation system.
2. Book bank
3. Exam Registration
4. Stock maintenance system.
5. Online course reservation system
6. E-ticketing
7. Software personnel management system
8. Credit card processing
9. e-book management system
10. Recruitment system
11. Foreign trading system
12. Conference Management System
13. BPO Management System
14. Library Management System
15. Student Information System

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to
- Design and implement projects using OO concepts.
- Use the UML analysis and design diagrams.
- Apply appropriate design patterns.
- Create code from design.
- Compare and contrast various testing techniques
LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

Suggested Software Tools:
Rational Suite (or) Argo UML (or) equivalent, Eclipse IDE and Junit

Software Tools
30 user License
Rational Suite
Open Source Alternatives: ArgoUML, Visual Paradigm
Eclipse IDE and JUnit

PCs
30

CS6512  INTERNET PROGRAMMING LABORATORY  L T P C
0 0 3 2

OBJECTIVES:
The student should be made to:

- Be familiar with Web page design using HTML/XML and style sheets
- Be exposed to creation of user interfaces using Java frames and applets.
- Learn to create dynamic web pages using server side scripting.
- Learn to write Client Server applications.
- Be familiar with the frameworks JSP Strut, Hibernate, Spring
- Be exposed to creating applications with AJAX

LIST OF EXPERIMENTS:
IMPLEMENT THE FOLLOWING:

WEBPAGE CONCEPTS
a) Create a web page with the following using HTML
   a. To embed a map in a web page
   b. To fix the hot spots in that map
   c. Show all the related information when the hot spots are clicked.

b) Create a web page with the following.
   a. Cascading style sheets.
   b. Embedded style sheets.
   c. Inline style sheets. Use our college information for the web pages.

c) Create and save an XML document at the server, which contains 10 users Information. Write a Program, which takes user Id as an input and returns the User details by taking the user information from the XML document.

SOCKETS & SERVLETS
a) Write programs in Java using sockets to implement the following:
   i. HTTP request
   ii. FTP
   iii. SMTP
   iv. POP3

b) Write a program in Java for creating simple chat application with datagram sockets and datagram packets.

c) Write programs in Java using Servlets:
   i. To invoke servlets from HTML forms
ii. To invoke servlets from Applets

d) Write programs in Java to create three-tier applications using servlets for conducting on-line examination for displaying student mark list. Assume that student information is available in a database which has been stored in a database server.

e) Write a program to lock servlet itself to a particular server IP address and port number. It requires an init parameter key that is appropriate for its servlet IP address and port before it unlocks itself and handles a request.

f) Session tracking using hidden form fields and Session tracking for a hit count.

 Install TOMCAT web server. Convert the static webpages of programs 1&2 into dynamic web pages using servlets (or JSP) and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart.

ADVANCE CONCEPTS:

a) Implement a simple program using following frameworks
   a. JSP Struts Framework b. Hibernate c. Spring

b) Explore the following application in AJAX: Searching in real time with live searches, Getting the answer with auto complete, Chatting with friends, Dragging and dropping with Ajax, Getting instant login feedback, Ajax-enabled popup menus, Modifying Web pages on the fly.

c) Write a web services for finding what people think by asking 500 people’s opinion for any consumer product.

d) Write a web services for predicting for any product sales.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Design Web pages using HTML/XML and style sheets
- Create user interfaces using Java frames and applets.
- Create dynamic web pages using server side scripting.
- Write Client Server applications.
- Use the frameworks JSP Strut, Hibernate, Spring
- Create applications with AJAX

REFERENCE:
spoken-tutorial.org.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

SOFTWARE:
Java, Dream Weaver or Equivalent, MySQL or Equivalent, Apache Server

HARDWARE:
Standalone desktops 30 Nos

CS6513 COMPUTER GRAPHICS LABORATORY

OBJECTIVES:
The student should be made to:

- Understand graphics programming
- Be exposed to creation of 3D graphical scenes using open graphics library suits
- Be familiar with image manipulation, enhancement
- Learn to create animations
- To create a multimedia presentation/Game/Project.
LIST OF EXPERIMENTS:
IMPLEMENT THE EXERCISES USING C / OPENGL / JAVA

1. Implementation of Algorithms for drawing 2D Primitives – Line (DDA, Bresenham) – all slopes
   Circle (Midpoint)
2. 2D Geometric transformations –
   Translation
   Rotation Scaling
   Reflection Shear
   Window-Viewport
3. Composite 2D Transformations
4. Line Clipping
5. 3D Transformations - Translation, Rotation, Scaling.
6. 3D Projections – Parallel, Perspective.
7. Creating 3D Scenes.
8. Image Editing and Manipulation - Basic Operations on image using any image editing software, Creating gif animated images, Image optimization.
9. 2D Animation – To create Interactive animation using any authoring tool.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to
- Create 3D graphical scenes using open graphics library suits
- Implement image manipulation and enhancement
- Create 2D animations using tools

REFERENCE:
spoken-tutorial.org

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

SOFTWARE
C, C++, Java, OpenGL

HARDWARE:
Standalone desktops - 30 Nos.
(or)
Server supporting 30 terminals or more.

CS6601 DISTRIBUTED SYSTEMS
L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- Understand foundations of Distributed Systems.
- Introduce the idea of peer to peer services and file system.
- Understand in detail the system level and support required for distributed system.
- Understand the issues involved in studying process and resource management.
UNIT I  INTRODUCTION

UNIT II  COMMUNICATION IN DISTRIBUTED SYSTEM

UNIT III  PEER TO PEER SERVICES AND FILE SYSTEM

UNIT IV  SYNCHRONIZATION AND REPLICATION

UNIT V  PROCESS & RESOURCE MANAGEMENT

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Discuss trends in Distributed Systems.
- Apply network virtualization.
- Apply remote method invocation and objects.
- Design process and resource management systems.

TEXT BOOK:

REFERENCES:
OBJECTIVES:
The student should be made to:
- Understand the basic concepts of mobile computing
- Be familiar with the network protocol stack
- Learn the basics of mobile telecommunication system
- Be exposed to Ad-Hoc networks
- Gain knowledge about different mobile platforms and application development

UNIT I  INTRODUCTION  9

UNIT II  MOBILE INTERNET PROTOCOL AND TRANSPORT LAYER  9

UNIT III  MOBILE TELECOMMUNICATION SYSTEM  9
Global System for Mobile Communication (GSM) – General Packet Radio Service (GPRS) – Universal Mobile Telecommunication System (UMTS).

UNIT IV  MOBILE AD-HOC NETWORKS  9

UNIT V  MOBILE PLATFORMS AND APPLICATIONS  9

OUTCOMES:
At the end of the course, the student should be able to:
- Explain the basics of mobile telecommunication system
- Choose the required functionality at each layer for given application
- Identify solution for each functionality at each layer
- Use simulator tools and design Ad hoc networks
- Develop a mobile application.

TEXT BOOK:
REFERENCES:
8. Windows Phone Dev Center : http://developer.windowsphone.com

CS6660 COMPILER DESIGN L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- Learn the design principles of a Compiler.
- Learn the various parsing techniques and different levels of translation
- Learn how to optimize and effectively generate machine codes

UNIT I INTRODUCTION TO COMPILERS
Translators-Compilation and Interpretation-Language processors -The Phases of Compiler -Errors Encountered in Different Phases-The Grouping of Phases-Compiler Construction Tools -Programming Language basics.

UNIT II LEXICAL ANALYSIS
Need and Role of Lexical Analyzer-Lexical Errors-Expressing Tokens by Regular Expressions- Converting Regular Expression to DFA- Minimization of DFA-Language for Specifying Lexical Analyzers-LEX-Design of Lexical Analyzer for a sample Language.

UNIT III SYNTAX ANALYSIS

UNIT IV SYNTAX DIRECTED TRANSLATION & RUN TIME ENVIRONMENT
Syntax directed Definitions-Construction of Syntax Tree-Bottom-up Evaluation of S-Attribute Definitions- Design of predictive translator - Type Systems-Specification of a simple type checker-Equivalence of Type Expressions-Type Conversions.

RUN-TIME ENVIRONMENT: Source Language Issues-Storage Organization-Storage Allocation-Parameter Passing-Symbol Tables-Dynamic Storage Allocation-Storage Allocation in FORTAN.
UNIT V  CODE OPTIMIZATION AND CODE GENERATION  9

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Design and implement a prototype compiler.
- Apply the various optimization techniques.
- Use the different compiler construction tools.

TEXTBOOK:

REFERENCES:

IT6502  DIGITAL SIGNAL PROCESSING   L T P C  3 1 0 4

OBJECTIVES:
- To introduce discrete Fourier transform and its applications.
- To teach the design of infinite and finite impulse response filters for filtering undesired signals.
- To introduce signal processing concepts in systems having more than one sampling frequency.

UNIT I  SIGNALS AND SYSTEMS  9

UNIT II  FREQUENCY TRANSFORMATIONS  9

UNIT III  IIR FILTER DESIGN  9
Structures of IIR – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives – (LPF, HPF, BPF, BRF) filter design using frequency translation.
UNIT IV     FIR FILTER DESIGN
Structures of FIR – Linear phase FIR filter – Fourier Series - Filter design using windowing techniques (Rectangular Window, Hamming Window, Hanning Window), Frequency sampling techniques

UNIT V     FINITE WORD LENGTH EFFECTS IN DIGITAL FILTERS
Binary fixed point and floating point number representations – Comparison - Quantization noise – truncation and rounding – quantization noise power- input quantization error- coefficient quantization error – limit cycle oscillations-dead band- Overflow error-signal scaling.

OUTCOMES:
Upon completion of the course, students will be able to:
• Perform frequency transforms for the signals.
• Design IIR and FIR filters.
• Finite word length effects in digital filters

TEXT BOOK:

REFERENCES:

CS6659     ARTIFICIAL INTELLIGENCE
OBJECTIVES:
The student should be made to:
• Study the concepts of Artificial Intelligence.
• Learn the methods of solving problems using Artificial Intelligence.
• Introduce the concepts of Expert Systems and machine learning.

UNIT I     INTRODUCTION TO AI AND PRODUCTION SYSTEMS
Introduction to AI-Problem formulation, Problem Definition -Production systems, Control strategies, Search strategies. Problem characteristics, Production system characteristics -Specialized production system- Problem solving methods - Problem graphs, Matching, Indexing and Heuristic functions -Hill Climbing-Depth first and Breath first, Constraints satisfaction - Related algorithms, Measure of performance and analysis of search algorithms.

UNIT II     REPRESENTATION OF KNOWLEDGE
Game playing - Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic-Structured representation of knowledge.
UNIT III KNOWLEDGE INFERENCE
Knowledge representation - Production based system, Frame based system. Inference - Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian Theory-Bayesian Network-Dempster - Shafer theory.

UNIT IV PLANNING AND MACHINE LEARNING

UNIT V EXPERT SYSTEMS

TOTAL: 45 PERIODS

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

- Identify problems that are amenable to solution by AI methods.
- Identify appropriate AI methods to solve a given problem.
- Formalise a given problem in the language/framework of different AI methods.
- Implement basic AI algorithms.
- Design and carry out an empirical evaluation of different algorithms on a problem formalisation, and state the conclusions that the evaluation supports.

TEXT BOOKS:

REFERENCES:
4. http://nptel.ac.in

CS6611 MOBILE APPLICATION DEVELOPMENT LABORATORY

OBJECTIVES:
The student should be made to:

- Know the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
- Understand how to work with various mobile application development frameworks.
- Learn the basic and important design concepts and issues of development of mobile applications.
- Understand the capabilities and limitations of mobile devices.

LIST OF EXPERIMENTS:
1. Develop an application that uses GUI components, Font and Colours
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Develop an application that makes use of RSS Feed.
7. Implement an application that implements Multi threading
8. Develop a native application that uses GPS location information.
9. Implement an application that writes data to the SD card.
10. Implement an application that creates an alert upon receiving a message.
11. Write a mobile application that creates alarm clock

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Design and Implement various mobile applications using emulators.
- Deploy applications to hand-held devices

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS
Standalone desktops with Windows or Android or iOS or Equivalent Mobile Application Development Tools with appropriate emulators and debuggers - 30 Nos.

CS6612 COMPILER LABORATORY L T P C
0 0 3 2

OBJECTIVES:
The student should be made to:
- Be exposed to compiler writing tools.
- Learn to implement the different Phases of compiler
- Be familiar with control flow and data flow analysis
- Learn simple optimization techniques

LIST OF EXPERIMENTS:
1. Implementation of Symbol Table
2. Develop a lexical analyzer to recognize a few patterns in C.
   (Ex. identifiers, constants, comments, operators etc.)
3. Implementation of Lexical Analyzer using Lex Tool
4. Generate YACC specification for a few syntactic categories.
   a) Program to recognize a valid arithmetic expression that uses operator +, -, *, and /.
   b) Program to recognize a valid variable which starts with a letter followed by any number of letters or digits.
   d) Implementation of Calculator using LEX and YACC
5. Convert the BNF rules into Yacc form and write code to generate Abstract Syntax Tree.
6. Implement type checking
7. Implement control flow analysis and Data flow Analysis
8. Implement any one storage allocation strategies(Heap, Stack, Static)
9. Construction of DAG
10. Implement the back end of the compiler which takes the three address code and produces the 8086 assembly language instructions that can be assembled and run using a 8086 assembler. The target assembly instructions can be simple move, add, sub, jump. Also simple addressing modes are used.
11. Implementation of Simple Code Optimization Techniques (Constant Folding, etc.)

TOTAL: 45 PERIODS
OUTCOMES:
At the end of the course, the student should be able to
- Implement the different Phases of compiler using tools
- Analyze the control flow and data flow of a typical program
- Optimize a given program
- Generate an assembly language program equivalent to a source language program

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
Standalone desktops with C / C++ compiler and Compiler writing tools 30 Nos.
(or)
Server with C / C++ compiler and Compiler writing tools supporting 30 terminals or more.
LEX and YACC

GE6674 COMMUNICATION AND SOFT SKILLS - LABORATORY BASED

OBJECTIVES:
- To enable learners to develop their communicative competence.
- To facilitate them to hone their soft skills.
- To equip them with employability skills to enhance their prospect of placements.

UNIT I LISTENING AND SPEAKING SKILLS
Conversational skills (formal and informal) – group discussion and interview skills – making presentations.
Listening to lectures, discussions, talk shows, news programmes, dialogues from TV/radio/Ted talk/Podcast – watching videos on interesting events on Youtube.

UNIT II READING AND WRITING SKILLS
Reading different genres of tests ranging from newspapers to philosophical treatises – reading strategies such as graphic organizers, summarizing and interpretation.

UNIT III ENGLISH FOR NATIONAL AND INTERNATIONAL EXAMINATIONS AND PLACEMENTS
International English Language Testing System (IELTS) – Test of English as a Foreign Language (TOEFL) – Graduate Record Examination (GRE) – Civil Service (Language related) – Verbal ability.

UNIT IV SOFT SKILLS (1)
UNIT V  SOFT SKILLS (2)  
Multiple intelligences – emotional intelligence – spiritual quotient (ethics) – intercultural communication – creative and critical thinking – learning styles and strategies.  

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:

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<th>S. No.</th>
<th>Description of Equipment (minimum configuration)</th>
<th>Qty Required</th>
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<tbody>
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<td>Server</td>
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<td></td>
<td>• 1 GB RAM / 40 GB HDD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• OS: Win 2000 server</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Audio card with headphones</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• JRE 1.3</td>
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</tr>
<tr>
<td>2</td>
<td>Client Systems</td>
<td>60 Nos.</td>
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<tr>
<td></td>
<td>• PIII System</td>
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<td></td>
<td>• 256 or 512 MB RAM / 40 GB HDD</td>
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<td>Cordless mike</td>
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<td>7</td>
<td>Audio Mixer</td>
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<tr>
<td>8</td>
<td>DVD recorder/player</td>
<td>1 No.</td>
</tr>
<tr>
<td>9</td>
<td>LCD Projector with MP3/CD/DVD provision for Audio/video facility</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
- Online Test - 35 marks
- Interview - 15 marks
- Presentation - 15 marks
- Group Discussion - 15 marks
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, case studies and abstract concept.

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.
3. 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

CS6701 CRYPTOGRAPHY AND NETWORK SECURITY

OBJECTIVES:
The student should be made to:
- Understand OSI security architecture and classical encryption techniques.
- Acquire fundamental knowledge on the concepts of finite fields and number theory.
- Understand various block cipher and stream cipher models.
- Describe the principles of public key cryptosystems, hash functions and digital signature.

UNIT I INTRODUCTION & NUMBER THEORY
Services, Mechanisms and attacks-the OSI security architecture-Network security model-Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, steganography).FINITE FIELDS AND NUMBER THEORY: Groups, Rings, Fields-Modular arithmetic-Euclid’s algorithm-Finite fields- Polynomial Arithmetic –Prime numbers-Fermat’s and Euler’s theorem-Testing for primality -The Chinese remainder theorem- Discrete logarithms.
UNIT II  BLOCK CIPHERS & PUBLIC KEY CRYPTOGRAPHY


UNIT III  HASH FUNCTIONS AND DIGITAL SIGNATURES


UNIT IV  SECURITY PRACTICE & SYSTEM SECURITY


UNIT V  E-MAIL, IP & WEB SECURITY


OUTCOMES:
Upon Completion of the course, the students should be able to:

- Compare various Cryptographic Techniques
- Design Secure applications
- Inject secure coding in the developed applications

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
The student should be made to:
- Be familiar with the most fundamental Graph Theory topics and results.
- Be exposed to the techniques of proofs and analysis.

UNIT I INTRODUCTION

UNIT II TREES, CONNECTIVITY & PLANARITY

UNIT III MATRICES, COLOURING AND DIRECTED GRAPH

UNIT IV PERMUTATIONS & COMBINATIONS
Fundamental principles of counting - Permutations and combinations - Binomial theorem - combinations with repetition - Combinatorial numbers - Principle of inclusion and exclusion - Derangements - Arrangements with forbidden positions.

UNIT V GENERATING FUNCTIONS
Generating functions - Partitions of integers - Exponential generating function – Summation operator - Recurrence relations - First order and second order – Non-homogeneous recurrence relations - Method of generating functions.

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students should be able to:
- Write precise and accurate mathematical definitions of objects in graph theory.
- Use mathematical definitions to identify and construct examples and to distinguish examples from non-examples.
- Validate and critically assess a mathematical proof.
- Use a combination of theoretical knowledge and independent mathematical thinking in creative investigation of questions in graph theory.
- Reason from definitions to construct mathematical proofs.

TEXT BOOKS:
REFERENCES:

CS6703  GRID AND CLOUD COMPUTING  LTFC
3  0 0 3

OBJECTIVES:
The student should be made to:
- Understand how Grid computing helps in solving large scale scientific problems.
- Gain knowledge on the concept of virtualization that is fundamental to cloud computing.
- Learn how to program the grid and the cloud.
- Understand the security issues in the grid and the cloud environment.

UNIT I  INTRODUCTION

UNIT II  GRID SERVICES

UNIT III  VIRTUALIZATION
Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: Everything as a service: Infrastructure, platform, software - Pros and Cons of cloud computing – Implementation levels of virtualization – virtualization structure – virtualization of CPU, Memory and I/O devices – virtual clusters and Resource Management – Virtualization for data center automation.

UNIT IV  PROGRAMMING MODEL

UNIT V  SECURITY
Trust models for Grid security environment – Authentication and Authorization methods – Grid security infrastructure – Cloud Infrastructure security: network, host and application level – aspects of data security, provider data and its security, Identity and access management architecture, IAM practices in the cloud, SaaS, PaaS, IaaS availability in the cloud, Key privacy issues in the cloud.

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

- Apply grid computing techniques to solve large scale scientific problems.
- Apply the concept of virtualization.
- Use the grid and cloud tool kits.
- Apply the security models in the grid and the cloud environment.

TEXT BOOK:

REFERENCES:
1. Jason Venner, “Pro Hadoop- Build Scalable, Distributed Applications in the Cloud”, A Press, 2009

CS6704 RESOURCE MANAGEMENT TECHNIQUES L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:

- Be familiar with resource management techniques.
- Learn to solve problems in linear programming and Integer programming.
- Be exposed to CPM and PERT.

UNIT I LINEAR PROGRAMMING 9

UNIT II DUALITY AND NETWORKS 9

UNIT III INTEGER PROGRAMMING 9
Cutting plan algorithm – Branch and bound methods, Multistage (Dynamic) programming.

UNIT IV CLASSICAL OPTIMISATION THEORY: 9
UNIT V  OBJECT SCHEDULING:
Network diagram representation – Critical path method – Time charts and resource leveling – PERT.

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students should be able to:
- Solve optimization problems using simplex method.
- Apply integer programming and linear programming to solve real-life applications.
- Use PERT and CPM for problems in project management

TEXT BOOK:

REFERENCES:

CS6711  SECURITY LABORATORY  L T P C
0 0 3 2

OBJECTIVES:
The student should be made to:
- Be exposed to the different cipher techniques
- Learn to implement the algorithms DES, RSA, MD5, SHA-1
- Learn to use network security tools like GnuPG, KF sensor, Net Strumbler

LIST OF EXPERIMENTS:
1. Implement the following SUBSTITUTION & TRANSPOSITION TECHNIQUES concepts:
   a) Caesar Cipher
   b) Playfair Cipher
   c) Hill Cipher
   d) Vigenere Cipher
   e) Rail fence – row & Column Transformation
2. Implement the following algorithms
   a) DES
   b) RSA Algorithm
   c) Diffiee-Hellman
   d) MD5
   e) SHA-1
5. Implement the SIGNATURE SCHEME - Digital Signature Standard
6. Demonstrate how to provide secure data storage, secure data transmission and for creating
digital signatures (GnuPG).
7. Setup a honey pot and monitor the honeypot on network (KF Sensor)
8. Installation of rootkits and study about the variety of options
9. Perform wireless audit on an access point or a router and decrypt WEP and WPA. (Net
   Stumbler)
10. Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w)

TOTAL: 45 PERIODS
OUTCOMES:
At the end of the course, the student should be able to
- Implement the cipher techniques
- Develop the various security algorithms
- Use different open source tools for network security and analysis

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE:
- C / C++ / Java or equivalent compiler
- GnuPG, KF Sensor or Equivalent, Snort, Net Stumbler or Equivalent

HARDWARE:
- Standalone desktops - 30 Nos.
  (or)
- Server supporting 30 terminals or more.

CS6712 GRID AND CLOUD COMPUTING LABORATORY

OBJECTIVES:
The student should be made to:
- Be exposed to tool kits for grid and cloud environment.
- Be familiar with developing web services/Applications in grid framework
- Learn to run virtual machines of different configuration.
- Learn to use Hadoop

LIST OF EXPERIMENTS:

GRID COMPUTING LAB
Use Globus Toolkit or equivalent and do the following:
1. Develop a new Web Service for Calculator.
2. Develop new OGSA-compliant Web Service.
4. Develop applications using Java or C/C++ Grid APIs
5. Develop secured applications using basic security mechanisms available in Globus Toolkit.
6. Develop a Grid portal, where user can submit a job and get the result. Implement it with and without GRAM concept.

CLOUD COMPUTING LAB
Use Eucalyptus or Open Nebula or equivalent to set up the cloud and demonstrate.
1. Find procedure to run the virtual machine of different configuration. Check how many virtual machines can be utilized at particular time.
2. Find procedure to attach virtual block to the virtual machine and check whether it holds the data even after the release of the virtual machine.
3. Install a C compiler in the virtual machine and execute a sample program.
4. Show the virtual machine migration based on the certain condition from one node to the other.
5. Find procedure to install storage controller and interact with it.
6. Find procedure to set up the one node Hadoop cluster.
7. Mount the one node Hadoop cluster using FUSE.
8. Write a program to use the API's of Hadoop to interact with it.
9. Write a wordcount program to demonstrate the use of Map and Reduce tasks

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to
- Use the grid and cloud tool kits.
- Design and implement applications on the Grid.
- Design and Implement applications on the Cloud.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE:
- Globus Toolkit or equivalent
- Eucalyptus or Open Nebula or equivalent

HARDWARE
- Standalone desktops 30 Nos

CS6801 MULTI-CORE ARCHITECTURES AND PROGRAMMING

OBJECTIVES:
The student should be made to:
- Understand the challenges in parallel and multi-threaded programming.
- Learn about the various parallel programming paradigms, and solutions.

UNIT I MULTI-CORE PROCESSORS

UNIT II PARALLEL PROGRAM CHALLENGES
- Performance – Scalability – Synchronization and data sharing – Data races – Synchronization primitives (mutexes, locks, semaphores, barriers) – deadlocks and livelocks – communication between threads (condition variables, signals, message queues and pipes).

UNIT III SHARED MEMORY PROGRAMMING WITH OpenMP

UNIT IV DISTRIBUTED MEMORY PROGRAMMING WITH MPI
- MPI program execution – MPI constructs – libraries – MPI send and receive – Point-to-point and Collective communication – MPI derived datatypes – Performance evaluation
OUTCOMES:
At the end of the course, the student should be able to:
- Program Parallel Processors.
- Develop programs using OpenMP and MPI.
- Compare and contrast programming for serial processors and programming for parallel processors.

TEXT BOOKS:

REFERENCES:

CS6811 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.

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.

TOTAL: 180 PERIODS
OBJECTIVES:
The student should be made to:
- Understand the foundations of CLR execution.
- Learn the technologies of the .NET framework.
- Know the object oriented aspects of C#.
- Be aware of application development in .NET.
- Learn web based applications on .NET (ASP.NET).

UNIT I   INTRODUCTION TO C#  9
Introducing C#, Understanding .NET, overview of C#, Literals, Variables, Data Types, Operators, checked and unchecked operators, Expressions, Branching, Looping, Methods, implicit and explicit casting, Constant, Arrays, Array Class, Array List, String, String Builder, Structure, Enumerations, boxing and unboxing.

UNIT II   OBJECT ORIENTED ASPECTS OF C#  9
Class, Objects, Constructors and its types, inheritance, properties, indexers, index overloading, polymorphism, sealed class and methods, interface, abstract class, abstract and interface, operator overloading, delegates, events, errors and exception, Threading.

UNIT III  APPLICATION DEVELOPMENT ON .NET  9
Building windows application, Creating our own window forms with events and controls, menu creation, inheriting window forms, SDI and MDI application, Dialog Box(Modal and Modeless), accessing data with ADO.NET, DataSet, typed dataset, Data Adapter, updating database using stored procedures, SQL Server with ADO.NET, handling exceptions, validating controls, windows application configuration.

UNIT IV   WEB BASED APPLICATION DEVELOPMENT ON .NET  9
Programming web application with web forms, ASP.NET introduction, working with XML and .NET, Creating Virtual Directory and Web Application, session management techniques, web.config, web services, passing datasets, returning datasets from web services, handling transaction, handling exceptions, returning exceptions from SQL Server.

UNIT V    CLR AND .NET FRAMEWORK  9
Assemblies, Versioning, Attributes, reflection, viewing meta data, type discovery, reflection on type, marshalling, remoting, security in .NET

TOTAL: 45 PERIODS

OUTCOMES:
After completing this course, the student will be able to:
- List the major elements of the .NET framework
- Explain how C# fits into the .NET platform
- Analyze the basic structure of a C# application
- Debug, compile, and run a simple application
- Develop programs using C# on .NET
- Design and develop Web based applications on .NET
- Discuss CLR.

TEXT BOOKS:
REFERENCES:

GE6757 TOTAL QUALITY MANAGEMENT L T P C 3 0 0 3 

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

UNIT I INTRODUCTION 9

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 - Bench marking - Reason to bench mark, Bench marking 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:
OBJECTIVES:
The student should be made to:
- Be familiar with the concepts of data warehouse and data mining,
- Be acquainted with the tools and techniques used for Knowledge Discovery in Databases.

UNIT I DATA WAREHOUSING

UNIT II BUSINESS ANALYSIS

UNIT III DATA MINING

UNIT IV ASSOCIATION RULE MINING AND CLASSIFICATION
Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining various Kinds of Association Rules – Correlation Analysis – Constraint Based Association Mining – Classification and Prediction - Basic Concepts - Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction.

UNIT V CLUSTERING AND TRENDS IN DATA MINING

TOTAL: 45 PERIODS

OUTCOMES:
After completing this course, the student will be able to:
- Apply data mining techniques and methods to large data sets.
- Use data mining tools
- Compare and contrast the various classifiers.

TEXT BOOKS:
REFERENCES:

CS6002 NETWORK ANALYSIS AND MANAGEMENT L T P C 3 0 0 3

OBJECTIVES:
The student should be made to:
- Learn network devices functions and configurations hub, switch, tap and routers.
- Be familiar with network Security Devices.
- Be exposed to network services.
- Understand and analyze application performance
- Learn to analyze network traffic and protocols
- Be aware of network-troubleshooting concepts.
- Understand network security concepts.

UNIT I A SYSTEM APPROACH TO NETWORK DESIGN AND REQUIREMENT ANALYSIS 9

UNIT II FLOW ANALYSIS: CONCEPTS, GUIDELINES AND PRACTICE 9

UNIT III LOGICAL DESIGN: CHOICES, INTERCONNECTION MECHANISMS, NETWORK MANAGEMENT AND SECURITY 9
UNIT IV NETWORK DESIGN: PHYSICAL, ADDRESSING AND ROUTING
Introduction- Evaluating cable plant design options – Network equipment placement- diagramming the physical design- diagramming the worksheet –case study. Introduction to Addressing and routing- establishing routing flow in the design environments- manipulating routing flows- developing addressing strategies- developing a routing strategy- case study.

UNIT V NETWORK MANAGEMENT AND SNMP PROTOCOL MODEL
Network and System management, Network management system platform; Current SNMP Broadband and TMN management, Network management standards. SNMPV1, SNMPV2 system architecture, SNMPV2, structure of management information. SNMPV2 – MIB – SNMPV2 protocol, SNMPV3-Architecture, Application, MIB, security user based security model, access control RMON.

OUTCOMES:
At the end of this course the students should be able to:
- Explain the key concepts and algorithms in complex network analysis.
- Apply a range of techniques for characterizing network structure.
- Discuss methodologies for analyzing networks of different fields.
- Demonstrate knowledge of recent research in the area and exhibit technical writing and presentation skills.

TEXT BOOKS:

REFERENCES:

IT6004 SOFTWARE TESTING

OBJECTIVES:
The student should be made to:
- Expose the criteria for test cases.
- Learn the design of test cases.
- Be familiar with test management and test automation techniques.
- Be exposed to test metrics and measurements.
UNIT I
INTRODUCTION

UNIT II
TEST CASE DESIGN

UNIT III
LEVELS OF TESTING
The need for Levers of Testing – Unit Test – Unit Test Planning – Designing the Unit Tests – The Test Harness – Running the Unit tests and Recording results – Integration tests – Designing Integration Tests – Integration Test Planning – Scenario testing – Defect bash elimination

UNIT IV
TEST MANAGEMENT

UNIT V
TEST AUTOMATION

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course the students will be able to
- Design test cases suitable for a software development for different domains.
- Identify suitable tests to be carried out.
- Prepare test planning based on the document.
- Document test plans and test cases designed.
- Use of automatic testing tools.
- Develop and validate a test plan.

TEXT BOOKS:
REFERENCES:

CS6003 AD HOC AND SENSOR NETWORKS L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- Understand the design issues in ad hoc and sensor networks.
- Learn the different types of MAC protocols.
- Be familiar with different types of adhoc routing protocols.
- Be expose to the TCP issues in adhoc networks.
- Learn the architecture and protocols of wireless sensor networks.

UNIT I INTRODUCTION

UNIT II MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS
Issues in designing a MAC Protocol- Classification of MAC Protocols- Contention based protocols- Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms – Multi channel MAC-IEEE 802.11

UNIT III ROUTING PROTOCOLS AND TRANSPORT LAYER IN AD HOC WIRELESS NETWORKS
Issues in designing a routing and Transport Layer protocol for Ad hoc networks- proactive routing, reactive routing (on-demand), hybrid routing- Classification of Transport Layer solutions-TCP over Ad hoc wireless Networks.

UNIT IV WIRELESS SENSOR NETWORKS (WSNS) AND MAC PROTOCOLS
Single node architecture: hardware and software components of a sensor node - WSN Network architecture: typical network architectures-data relaying and aggregation strategies -MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC- IEEE 802.15.4.

UNIT V WSN ROUTING, LOCALIZATION & QOS

TOTAL: 45 PERIODS
OUTCOMES:
Upon completion of the course, the student should be able to:
- Explain the concepts, network architectures and applications of ad hoc and wireless sensor networks
- Analyze the protocol design issues of ad hoc and sensor networks
- Design routing protocols for ad hoc and wireless sensor networks with respect to some protocol design issues
- Evaluate the QoS related performance measurements of ad hoc and sensor networks

TEXT BOOK:

REFERENCES:

CS6004 CYBER FORENSICS  L T P C  3 0 0 3

OBJECTIVES:
The student should be made to:
- Learn the security issues network layer and transport layer
- Be exposed to security issues of the application layer
- Learn computer forensics
- Be familiar with forensics tools
- Learn to analyze and validate forensics data

UNIT I NETWORK LAYER SECURITY & TRANSPORT LAYER SECURITY

UNIT II E-MAIL SECURITY & FIREWALLS
PGP - S/MIME - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs - SET for E-Commerce Transactions.

UNIT III INTRODUCTION TO COMPUTER FORENSICS
UNIT IV  EVIDENCE COLLECTION AND FORENSICS TOOLS

UNIT V  ANALYSIS AND VALIDATION
Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the student should be able to:
- Discuss the security issues network layer and transport layer
- Apply security principles in the application layer
- Explain computer forensics
- Use forensics tools
- Analyze and validate forensics data

TEXT BOOKS:

REFERENCES:

CS6005  ADVANCED DATABASE SYSTEMS

OBJECTIVES:
The student should be made to:
- Learn different types of databases.
- Be exposed to query languages.
- Be familiar with the indexing techniques.

UNIT I  PARALLEL AND DISTRIBUTED DATABASES

UNIT II  ACTIVE DATABASES
UNIT III  TEMPORAL AND OBJECT DATABASES  

UNIT IV  COMPLEX QUERIES AND REASONING  

UNIT V  SPATIAL, TEXT AND MULTIMEDIA DATABASES  

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the student should be able to:

- Design different types of databases.
- Use query languages.
- Apply indexing techniques.

TEXT BOOK:

REFERENCES:

OBJECTIVES:
The student should be made to:

- Exposed to the need for Bioinformatics technologies
- Be familiar with the modeling techniques
- Learn microarray analysis
- Exposed to Pattern Matching and Visualization

UNIT I  INTRODUCTION  
Need for Bioinformatics technologies – Overview of Bioinformatics technologies Structural bioinformatics – Data format and processing – Secondary resources and applications – Role of Structural bioinformatics - Biological Data Integration System.
UNIT II  DATAWAREHOUSING AND DATAMINING IN BIOINFORMATICS  
Bioinformatics data – Data warehousing architecture – data quality – Biomedical data analysis – DNA data analysis – Protein data analysis – Machine learning – Neural network architecture and applications in bioinformatics.

UNIT III  MODELING FOR BIOINFORMATICS  

UNIT IV  PATTERN MATCHING AND VISUALIZATION  

UNIT V  MICROARRAY ANALYSIS  

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to

- Develop models for biological data.
- Apply pattern matching techniques to bioinformatics data – protein data genomic data.
- Apply micro array technology for genomic expression study.

TEXT BOOK:

REFERENCES:

IT6801  SERVICE ORIENTED ARCHITECTURE  

OBJECTIVES:
The student should be made to:

- Learn XML fundamentals.
- Be exposed to build applications based on XML.
- Understand the key principles behind SOA.
- Be familiar with the web services technology elements for realizing SOA.
- Learn the various web service standards.
UNIT I  INTRODUCTION TO XML

UNIT II  BUILDING XML- BASED APPLICATIONS

UNIT III  SERVICE ORIENTED ARCHITECTURE
Characteristics of SOA, Comparing SOA with Client-Server and Distributed architectures – Benefits of SOA -- Principles of Service orientation – Service layers.

UNIT IV  WEB SERVICES

UNIT V  BUILDING SOA-BASED APPLICATIONS

TOTAL : 45 PERIODS

OUTCOMES:
Upon successful completion of this course, students will be able to:
• Build applications based on XML.
• Develop web services using technology elements.
• Build SOA-based applications for intra-enterprise and inter-enterprise applications.

TEXTBOOKS:

REFERENCES:

IT6005  DIGITAL IMAGE PROCESSING

OBJECTIVES:
The student should be made to:
• Learn digital image fundamentals.
• Be exposed to simple image processing techniques.
• Be familiar with image compression and segmentation techniques.
• Learn to represent image in form of features.
UNIT I  DIGITAL IMAGE FUNDAMENTALS  8

UNIT II  IMAGE ENHANCEMENT  10

UNIT III  IMAGE RESTORATION AND SEGMENTATION  9

UNIT IV  WAVELETS AND IMAGE COMPRESSION  9

UNIT V  IMAGE REPRESENTATION AND RECOGNITION  9

TOTAL: 45 PERIODS

OUTCOMES:
Upon successful completion of this course, students will be able to:
- Discuss digital image fundamentals.
- Apply image enhancement and restoration techniques.
- Use image compression and segmentation Techniques.
- Represent features of images.

TEXT BOOK:

REFERENCES:
OBJECTIVES:
The student should be made to:
- Learn the architecture and programming of ARM processor.
- Be familiar with the embedded computing platform design and analysis.
- Be exposed to the basic concepts of real time Operating system.
- Learn the system design techniques and networks for embedded systems

UNIT I  INTRODUCTION TO EMBEDDED COMPUTING AND ARM PROCESSORS

Complex systems and micro processors– Embedded system design process –Design example: Model train controller- Instruction sets preliminaries - ARM Processor – CPU; programming input and output- supervisor mode, exceptions and traps – Co-processors- Memory system mechanisms – CPU performance- CPU power consumption.

UNIT II  EMBEDDED COMPUTING PLATFORM DESIGN

The CPU Bus-Memory devices and systems–Designing with computing platforms – consumer electronics architecture – platform-level performance analysis - Components for embedded programs- Models of programs- Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization – Program level energy and power analysis and optimization – Analysis and optimization of program size- Program validation and testing.

UNIT III  PROCESSES AND OPERATING SYSTEMS

Introduction – Multiple tasks and multiple processes – Multirate systems- Preemptive real-time operating systems- Priority based scheduling- Interprocess communication mechanisms – Evaluating operating system performance- power optimization strategies for processes – Example Real time operating systems-POSIX-Windows CE.

UNIT V  SYSTEM DESIGN TECHNIQUES AND NETWORKS

Design methodologies- Design flows - Requirement Analysis – Specifications-System analysis and architecture design – Quality Assurance techniques- Distributed embedded systems – MPSoCs and shared memory multiprocessors.

UNIT V  CASE STUDY

Data compressor - Alarm Clock - Audio player - Software modem-Digital still camera - Telephone answering machine-Engine control unit – Video accelerator.

OUTCOMES:
Upon completion of the course, students will be able to:
- Describe the architecture and programming of ARM processor.
- Outline the concepts of embedded systems
- Explain the basic concepts of real time Operating system design.
- Use the system design techniques to develop software for embedded systems
- Differentiate between the general purpose operating system and the real time operating system
- Model real-time applications using embedded-system concepts

TEXT BOOK:
REFERENCES:

CS6006 GAME PROGRAMMING

OBJECTIVES:
The student should be made to:
- Understand the concepts of Game design and development.
- Learn the processes, mechanics and issues in Game Design.
- Be exposed to the Core architectures of Game Programming.
- Know about Game programming platforms, frame works and engines.
- Learn to develop games.

UNIT I 3D GRAPHICS FOR GAME PROGRAMMING
3D Transformations, Quaternions, 3D Modeling and Rendering, Ray Tracing, Shader Models, Lighting, Color, Texturing, Camera and Projections, Culling and Clipping, Character Animation, Physics-based Simulation, Scene Graphs.

UNIT II GAME ENGINE DESIGN
Game engine architecture, Engine support systems, Resources and File systems, Game loop and real-time simulation, Human Interface devices, Collision and rigid body dynamics, Game profiling.

UNIT III GAME PROGRAMMING
Application layer, Game logic, Game views, managing memory, controlling the main loop, loading and caching game data, User Interface management, Game event management.

UNIT IV GAMING PLATFORMS AND FRAMEWORKS
2D and 3D Game development using Flash, DirectX, Java, Python, Game engines - DX Studio, Unity.

UNIT V GAME DEVELOPMENT
Developing 2D and 3D interactive games using DirectX or Python – Isometric and Tile Based Games, Puzzle games, Single Player games, Multi Player games.

TOTAL: 45 PERIODS
OUTCOMES:
Upon completion of the course, students will be able to
- Discuss the concepts of Game design and development.
- Design the processes, and use mechanics for game development.
- Explain the Core architectures of Game Programming.
- Use Game programming platforms, frame works and engines.
- Create interactive Games.

TEXT BOOKS:

REFERENCES:

CS6007 INFORMATION RETRIEVAL L T P C
3 0 0 3

OBJECTIVES:
The Student should be made to:
- Learn the information retrieval models.
- Be familiar with Web Search Engine.
- Be exposed to Link Analysis.
- Understand Hadoop and Map Reduce.
- Learn document text mining techniques.

UNIT I INTRODUCTION 9

UNIT II INFORMATION RETRIEVAL 9

UNIT III WEB SEARCH ENGINE – INTRODUCTION AND CRAWLING 9
UNIT IV  WEB SEARCH – LINK ANALYSIS AND SPECIALIZED SEARCH

UNIT V  DOCUMENT TEXT MINING
Information filtering; organization and relevance feedback – Text Mining -Text classification and clustering - Categorization algorithms: naive Bayes; decision trees; and nearest neighbor - Clustering algorithms: agglomerative clustering; k-means; expectation maximization (EM).

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, students will be able to
- Apply information retrieval models.
- Design Web Search Engine.
- Use Link Analysis.
- Use Hadoop and Map Reduce.
- Apply document text mining techniques.

TEXT BOOKS:

REFERENCES:

IT6006  DATA ANALYTICS  L T P C  3 0 0 3

OBJECTIVES:
The Student should be made to:
- Be exposed to big data
- Learn the different ways of Data Analysis
- Be familiar with data streams
- Learn the mining and clustering
- Be familiar with the visualization
UNIT I  INTRODUCTION TO BIG DATA  8

UNIT II  DATA ANALYSIS  12

UNIT III  MINING DATA STREAMS  8

UNIT IV  FREQUENT ITEMSETS AND CLUSTERING  9

UNIT V  FRAMEWORKS AND VISUALIZATION  8
MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed file systems – Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications:

TOTAL: 45 PERIODS

OUTCOMES:
The student should be made to:
- Apply the statistical analysis methods.
- Compare and contrast various soft computing frameworks.
- Design distributed file systems.
- Apply Stream data model.
- Use Visualisation techniques

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
The student should be made to:
- Learn the foundations of Human Computer Interaction.
- Be familiar with the design technologies for individuals and persons with disabilities.
- Be aware of mobile HCI.
- Learn the guidelines for user interface.

UNIT I FOUNDATIONS OF HCI
The Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices –
elements – interactivity- Paradigms.

UNIT II DESIGN & SOFTWARE PROCESS
Interactive Design basics – process – scenarios – navigation – screen design – Iteration and
prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in
Techniques – Universal Design.

UNIT III MODELS AND THEORIES
Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and
collaboration models-Hypertext, Multimedia and WWW.

UNIT IV MOBILE HCI
Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets,
Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile
Design, Tools.

UNIT V WEB INTERFACE DESIGN
Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and

OUTCOMES:
Upon completion of the course, the student should be able to:
- Design effective dialog for HCI.
- Design effective HCI for individuals and persons with disabilities.
- Assess the importance of user feedback.
- Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
- Develop meaningful user interface.

TEXT BOOKS:
   (UNIT –IV).
OBJECTIVES:
The student should be made to:
- Learn nano computing challenges.
- Be familiar with the imperfections.
- Be exposed to reliability evaluation strategies.
- Learn nano scale quantum computing.
- Understand Molecular Computing and Optimal Computing.

UNIT I  NANOCOMPUTING-PROSPECTS AND CHALLENGES  9

UNIT II  NANOCOMPUTING WITH IMPERFECTIONS  9

UNIT III RELIABILITY OF NANOCOMPUTING  9

UNIT IV  NANO SCALE QUANTUM COMPUTING  9

UNIT V  QCADESIGNER SOFTWARE AND QCA IMPLEMENTATION  9

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the student should be able to:
- Discuss nano computing challenges.
- Handle the imperfections.
- Apply reliability evaluation strategies.
- Use nano scale quantum computing.
- Utilize Molecular Computing and Optimal Computing.

TEXT BOOK:

REFERENCES:
OBJECTIVES:
The student should be made to:
- Learn the Evolution of Knowledge management.
- Be familiar with tools.
- Be exposed to Applications.
- Be familiar with some case studies.

UNIT I INTRODUCTION
An Introduction to Knowledge Management - The foundations of knowledge management- including cultural issues- technology applications organizational concepts and processes- management aspects- and decision support systems. The Evolution of Knowledge management: From Information Management to Knowledge Management - Key Challenges Facing the Evolution of Knowledge Management - Ethics for Knowledge Management.

UNIT II CREATING THE CULTURE OF LEARNING AND KNOWLEDGE SHARING

UNIT III KNOWLEDGE MANAGEMENT-THE TOOLS
Telecommunications and Networks in Knowledge Management - Internet Search Engines and Knowledge Management - Information Technology in Support of Knowledge Management - Knowledge Management and Vocabulary Control - Information Mapping in Information Retrieval - Information Coding in the Internet Environment - Repackaging Information.

UNIT IV KNOWLEDGEMANAGEMENT-APPLICATION
Components of a Knowledge Strategy - Case Studies (From Library to Knowledge Center, Knowledge Management in the Health Sciences, Knowledge Management in Developing Countries).

UNIT V FUTURE TRENDS AND CASE STUDIES
Advanced topics and case studies in knowledge management - Development of a knowledge management map/plan that is integrated with an organization's strategic and business plan - A case study on Corporate Memories for supporting various aspects in the process life -cycles of an organization.

OUTCOMES:
Upon completion of the course, the student should be able to:
- Use the knowledge management tools.
- Develop knowledge management Applications.
- Design and develop enterprise applications.

TEXT BOOK:

REFERENCE:
OBJECTIVES:
The student should be made to:
- Understand the concept of semantic web and related applications.
- Learn knowledge representation using ontology.
- Understand human behaviour in social web and related communities.
- Learn visualization of social networks.

UNIT I INTRODUCTION

UNIT II MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION

UNIT III EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS

UNIT IV PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES

UNIT V VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS

OUTCOMES:
Upon completion of the course, the student should be able to:
- Develop semantic web related applications.
- Represent knowledge using ontology.
- Predict human behaviour in social web and related communities.
- Visualize social networks.
TEXT BOOKS:

REFERENCES:

MG6088 SOFTWARE PROJECT MANAGEMENT

OBJECTIVES:
- To outline the need for Software Project Management
- To highlight different techniques for software cost estimation and activity planning.

UNIT I PROJECT EVALUATION AND PROJECT PLANNING

UNIT II PROJECT LIFE CYCLE AND EFFORT ESTIMATION

UNIT III ACTIVITY PLANNING AND RISK MANAGEMENT

UNIT IV PROJECT MANAGEMENT AND CONTROL
UNIT V   STAFFING IN SOFTWARE PROJECTS  9

OUTCOMES:
• At the end of the course the students will be able to practice Project Management principles while developing a software.

TEXTBOOK:

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

UNIT II  ENGINEERING ETHICS  9

UNIT III  ENGINEERING AS SOCIAL EXPERIMENTATION  9
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV  SAFETY, RESPONSIBILITIES AND RIGHTS  9
UNIT V  GLOBAL ISSUES
TOTAL: 45 PERIODS

OUTCOMES:
• 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

CS6011  NATURAL LANGUAGE PROCESSING  L  T  P  C
3  0  0  3

OBJECTIVES:
The student should be made to:
• Learn the techniques in natural language processing.
• Be familiar with the natural language generation.
• Be exposed to machine translation.
• Understand the information retrieval techniques.

UNIT I  OVERVIEW AND LANGUAGE MODELING

UNIT II  WORD LEVEL AND SYNTACTIC ANALYSIS
Syntactic Analysis: Context-free Grammar-Constituency- Parsing-Probabilistic Parsing.
UNIT III  SEMANTIC ANALYSIS AND DISCOURSE PROCESSING

UNIT IV  NATURAL LANGUAGE GENERATION AND MACHINE TRANSLATION

UNIT V  INFORMATION RETRIEVAL AND LEXICAL RESOURCES

OUTCOMES:
Upon completion of the course, the student should be able to:
- Analyze the natural language text.
- Generate the natural language.
- Do machine translation.
- Apply information retrieval techniques.

TEXT BOOK:

REFERENCES:

CS6012  SOFT COMPUTING

OBJECTIVES:
The student should be made to:
- Learn the various soft computing frame works.
- Be familiar with design of various neural networks.
- Be exposed to fuzzy logic.
- Learn genetic programming.
- Be exposed to hybrid systems.
UNIT I  INTRODUCTION  9

UNIT II  NEURAL NETWORKS  9

UNIT III  FUZZY LOGIC  9

UNIT IV  GENETIC ALGORITHM  9

UNIT V  HYBRID SOFT COMPUTING TECHNIQUES & APPLICATIONS  9

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the student should be able to:
- Apply various soft computing frame works.
- Design of various neural networks.
- Use fuzzy logic.
- Apply genetic programming.
- Discuss hybrid soft computing.

TEXT BOOKS:
REFERENCES:
### ANNA UNIVERSITY, CHENNAI
AFFILIATED INSTITUTIONS
R-2013
B.TECH INFORMATION TECHNOLOGY
I - VIII SEMESTERS CURRICULUM AND SYLLABUS

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**TOTAL NO. OF CREDITS: 187**

**LIST OF ELECTIVES**

**SEMESTER VI – ELECTIVE I**

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**SEMESTER VIII – ELECTIVE IV**

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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

- Project
- Assignment
- Reviews
- Creative writing
- Poster making, etc.

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

L T P C
3 1 0 4

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


UNIT II SEQUENCES AND SERIES

UNIT III  
APPLICATIONS OF DIFFERENTIAL CALCULUS  
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  

UNIT V  
MULTIPLE INTEGRALS  

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.

TEXT BOOKS:

REFERENCES:

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  
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  
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

UNIT III        QUANTUM PHYSICS  

UNIT IV        ACOUSTICS AND ULTRASONICS  
Production of ultrasonics 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

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
1. Sears and Zemansky. University Physics, 2009
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 polydispersity 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 isochore (problems).

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY


UNIT IV PHASE RULE AND ALLOYS


UNIT V NANOCHEMISTRY

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, electrodeposition, 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.

TEXT BOOKS:

REFERENCES:

GE6151 COMPUTER PROGRAMMING

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 familiar with 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:

GE6152 ENGINEERING GRAPHICS

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 5+9
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 5+9
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 5+9
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 6+9
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) 3
Introduction to drafting packages and demonstration of their use.

TOTAL: 75 PERIODS

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

TEXT BOOK:

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:
1. Search, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions – Includes Parameter Passing
9. Program using Recursive Function and conversion from given program to flow chart.
10. 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 EQUIPMENT FOR A BATCH OF 30 STUDENTS:
Standalone desktops with C compiler 30 Nos.
(or)
Server with C compiler supporting 30 terminals or more.
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.

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

**REFERENCES:**

**GE6163 PHYSICS AND CHEMISTRY 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

LIST OF EXPERIMENTS
(Any FIVE Experiments)

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 vacmetry.

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)
6. Determination of molecular weight of polyvinylalcohol using Ostwald viscometer
7. Conductometric titration of strong acid vs strong base

TOTAL: 30 PERIODS

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);
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%

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 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 9+3
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  9+3
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  9+3

UNIT IV  ANALYTIC FUNCTIONS  9+3
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, z², e^z and bilinear transformation.

UNIT V  COMPLEX INTEGRATION  9+3
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.

TEXT BOOKS:

REFERENCES:
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
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

UNIT V  ADVANCED ENGINEERING MATERIALS

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

TEXT BOOKS:

REFERENCES:
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
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

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.

TEXT BOOKS:
   Delhi., 2011
   2010

REFERENCES:
   Company Pvt. Ltd. Chennai, 2009

CS6201 DIGITAL PRINCIPLES AND SYSTEM DESIGN L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
• Learn the various number systems.
• Learn Boolean Algebra
• Understand the various logic gates.
• Be familiar with various combinational circuits.
• Be familiar with designing synchronous and asynchronous sequential circuits.
• Be exposed to designing using PLD

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES
9
Review of Number Systems – Arithmetic Operations – Binary Codes – Boolean Algebra and
Theorems – Boolean Functions – Simplification of Boolean Functions using Karnaugh Map and
Tabulation Methods – Logic Gates – NAND and NOR Implementations.

UNIT II COMBINATIONAL LOGIC
9
Combinational Circuits – Analysis and Design Procedures – Circuits for Arithmetic Operations, Code
Conversion – Decoders and Encoders – Multiplexers and Demultiplexers – Introduction to HDL –
HDL Models of Combinational circuits.

UNIT III SYNCHRONOUS SEQUENTIAL LOGIC
9
Sequential Circuits – Latches and Flip Flops – Analysis and Design Procedures – State Reduction
and State Assignment – Shift Registers – Counters – HDL for Sequential Logic Circuits.

UNIT IV ASYNCHRONOUS SEQUENTIAL LOGIC
9
Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and Flow Tables –
Race-free State Assignment – Hazards.
UNIT V MEMORY AND PROGRAMMABLE LOGIC


TOTAL: 45 PERIODS

OUTCOMES:
At the end of this course, the student will be able to:

- Perform arithmetic operations in any number system.
- Simplify the Boolean expression using K-Map and Tabulation techniques.
- Use boolean simplification techniques to design a combinational hardware circuit.
- Design and Analysis of a given digital circuit – combinational and sequential.
- Design using PLD.

TEXT BOOK:

REFERENCES:

CS6202 PROGRAMMING AND DATA STRUCTURES I

OBJECTIVES:
The student should be made to:

- Be familiar with the basics of C programming language.
- Be exposed to the concepts of ADTs
- Learn linear data structures – list, stack, and queue.
- Be exposed to sorting, searching, hashing algorithms

UNIT I C PROGRAMMING FUNDAMENTALS- A REVIEW
Conditional statements – Control statements – Functions – Arrays – Preprocessor - Pointers - Variation in pointer declarations – Function Pointers – Function with Variable number of arguments

UNIT II C PROGRAMMING ADVANCED FEATURES
Structures and Unions - File handling concepts – File read – write – binary and Stdio - File Manipulations

UNIT III LINEAR DATA STRUCTURES – LIST
Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation — singly linked lists- circularly linked lists- doubly-linked lists – applications of lists –Polynomial Manipulation – All operation (Insertion, Deletion, Merge, Traversal)
UNIT IV  LINEAR DATA STRUCTURES – STACKS, QUEUES  9
Stack ADT – Evaluating arithmetic expressions- other applications- Queue ADT – circular queue implementation – Double ended Queues – applications of queues

UNIT V  SORTING, SEARCHING AND HASH TECHNIQUES  9

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• Use the control structures of C appropriately for problems.
• Implement abstract data types for linear data structures.
• Apply the different linear data structures to problem solutions.
• Critically analyse the various algorithms.

TEXT BOOKS:

REFERENCES:

GE6262 PHYSICS AND CHEMISTRY LABORATORY – II

L T P C
0 0 2 1

PHYSICS LABORATORY – II

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

(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

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
(Any FIVE Experiments)

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.

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:
   organic chemistry, LBS Singapore (1994).

- 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, porcelain tile, dropper (30 Nos each)
OBJECTIVES:
The student should be made to:
- Understand the various logic gates.
- Be familiar with various combinational circuits.
- Understand the various components used in the design of digital computers.
- Be exposed to sequential circuits
- Learn to use HDL

LIST OF EXPERIMENTS:
1. Verification of Boolean Theorems using basic gates.
2. Design and implementation of combinational circuits using basic gates for arbitrary functions, code converters.
3. Design and implementation of combinational circuits using MSI devices:
   - 4 – bit binary adder / subtractor
   - Parity generator / checker
   - Magnitude Comparator
   - Application using multiplexers
4. Design and implementation of sequential circuits:
   - Shift – registers
   - Synchronous and asynchronous counters
5. Coding combinational / sequential circuits using HDL.
6. Design and implementation of a simple digital system (Mini Project).

OUTCOMES:
At the end of this course, the student will be able to:
- Use boolean simplification techniques to design a combinational hardware circuit.
- Design and Implement combinational and sequential circuits.
- Analyze a given digital circuit – combinational and sequential.
- Design the different functional units in a digital computer system.
- Design and Implement a simple digital system.

TOTAL: 45 PERIODS

LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS
HARDWARE:
1. Digital trainer kits 30
2. Digital ICs required for the experiments in sufficient numbers 96

SOFTWARE:
1. HDL simulator.

OBJECTIVES:
The students should be made to:
- Be familiar with c programming
- Be exposed to implementing abstract data types
- Learn to use files
Learn to implement sorting and searching algorithms.

1. C Programs using Conditional and Control Statements
2. C Programs using Arrays, Strings and Pointers and Functions
3. Representation of records using Structures in C – Creation of Linked List – Manipulation of records in a Linked List
4. File Handling in C – Sequential access – Random Access
5. Operations on a Stack and Queue – infix to postfix – simple expression evaluation using stacks - Linked Stack Implementation – Linked Queue Implementation
6. Implementation of Sorting algorithms
7. Implementation of Linear search and Binary Search.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Design and implement C programs for implementing stacks, queues, linked lists.
- Apply good programming design methods for program development.
- Apply the different data structures for implementing solutions to practical problems.
- Develop searching and sorting 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.

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  9+3

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

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:

CS6301  PROGRAMMING AND DATA STRUCTURES II  L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- Be familiar with the C++ concepts of abstraction, encapsulation, constructor, polymorphism, overloading and Inheritance.
- Learn advanced nonlinear data structures.
- Be exposed to graph algorithms
- Learn to apply Tree and Graph structures

UNIT I  OBJECT ORIENTED PROGRAMMING FUNDAMENTALS  9
C++ Programming features - Data Abstraction - Encapsulation - class - object - constructors - static members – constant members – member functions – pointers – references - Role of this pointer – Storage classes – function as arguments.
UNIT II  OBJECT ORIENTED PROGRAMMING CONCEPTS  9
String Handling – Copy Constructor - Polymorphism – compile time and run time polymorphisms –
function overloading – operators overloading – dynamic memory allocation - Nested classes -
Inheritance – virtual functions.

UNIT III  C++ PROGRAMMING ADVANCED FEATURES  9
Abstract class – Exception handling - Standard libraries - Generic Programming - templates – class
template - function template – STL – containers – iterators – function adaptors – allocators -
Parameterizing the class - File handling concepts.

UNIT IV  ADVANCED NON-LINEAR DATA STRUCTURES  9

UNIT V  GRAPHS  9
Representation of Graphs – Breadth-first search – Depth-first search – Topological sort – Minimum

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Design problem solutions using Object Oriented Techniques.
- Apply the concepts of data abstraction, encapsulation and inheritance for problem solutions.
- Use the control structures of C++ appropriately.
- Critically analyse the various algorithms.
- Apply the different data structures to problem solutions.

TEXT BOOKS:

REFERENCES:
1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, ”Introduction to
UNIT I  INTRODUCTION TO DBMS  10
File Systems Organization - Sequential, Pointer, Indexed, Direct - Purpose of Database System-
Database System Terminologies-Database characteristics- Data models – Types of data models –
Components of DBMS- Relational Algebra.  LOGICAL DATABASE DESIGN: Relational DBMS -
Codd's Rule - Entity-Relationship model - Extended ER Normalization – Functional Dependencies,
Anomaly- 1NF to 5NF- Domain Key Normal Form – Denormalization.

UNIT II  SQL & QUERY OPTIMIZATION  8
SQL Standards - Data types - Database Objects- DDL-DML-DCL-TCL-Embedded SQL-Static Vs
Dynamic SQL - QUERY OPTIMIZATION: Query Processing and Optimization - Heuristics and Cost
Estimates in Query Optimization.

UNIT III  TRANSACTION PROCESSING AND CONCURRENCY CONTROL  8
Introduction-Properties of Transaction- Serializability- Concurrency Control – Locking Mechanisms-
Two Phase Commit Protocol-Dead lock.

UNIT IV  TRENDS IN DATABASE TECHNOLOGY  10
Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ tree Index Files – B-
tree Index Files – Static Hashing – Dynamic Hashing - Introduction to Distributed Databases- Client
server technology- Multidimensional and Parallel databases- Spatial and multimedia databases-
Mobile and web databases- Data Warehouse-Mining- Data marts.

UNIT V  ADVANCED TOPICS  9
DATABASE SECURITY: Data Classification-Threats and risks – Database access Control – Types of
Privileges –Cryptography- Statistical Databases.- Distributed Databases-Architecture-Transaction
Processing-Data Warehousing and Mining-Information Clustering-Information Retrieval- Relevance ranking-Crawling and Indexing the Web- Object Oriented Databases-XML
Databases.

OUTCOMES:
At the end of the course, the student should be able to:
- Design Databases for applications.
- Use the Relational model, ER diagrams.
- Apply concurrency control and recovery mechanisms for practical problems.
- Design the Query Processor and Transaction Processor.
- Apply security concepts to databases.

TEXT BOOK:

REFERENCES:
2. C.J.Date, A.Kannan and S.Swamyathan, “An Introduction to Database Systems”, Eighth
3. Atul Kahate, “Introduction to Database Management Systems”, Pearson Education, New Delhi,
2006.

CS6303 COMPUTER ARCHITECTURE

OBJECTIVES:
- To make students understand the basic structure and operation of digital computer.
- To understand the hardware-software interface.
- To familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations.
- To expose the students to the concept of pipelining.
- To familiarize the students with hierarchical memory system including cache memories and virtual memory.
- To expose the students with different ways of communicating with I/O devices and standard I/O interfaces.

UNIT I OVERVIEW & INSTRUCTIONS

UNIT II ARITHMETIC OPERATIONS
ALU - Addition and subtraction – Multiplication – Division – Floating Point operations – Subword parallelism.

UNIT III PROCESSOR AND CONTROL UNIT
Basic MIPS implementation – Building datapath – Control Implementation scheme – Pipelining – Pipelined datapath and control – Handling Data hazards & Control hazards – Exceptions.

UNIT IV PARALLELISM
Instruction-level-parallelism – Parallel processing challenges – Flynn's classification – Hardware multithreading – Multicore processors

UNIT V MEMORY AND I/O SYSTEMS
Memory hierarchy - Memory technologies – Cache basics – Measuring and improving cache performance - Virtual memory, TLBs - Input/output system, programmed I/O, DMA and interrupts, I/O processors.

OUTCOMES:
At the end of the course, the student should be able to:
- Design arithmetic and logic unit.
- Design and anlayse pipelined control units
- Evaluate performance of memory systems.
- Understand parallel processing architectures.

TEXT BOOK:
REFERENCES:

CS6304 ANALOG AND DIGITAL COMMUNICATION L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- Understand analog and digital communication techniques.
- Learn data and pulse communication techniques.
- Be familiarized with source and Error control coding.
- Gain knowledge on multi-user radio communication.

UNIT I ANALOG COMMUNICATION

UNIT II DIGITAL COMMUNICATION

UNIT III DATA AND PULSE COMMUNICATION

UNIT IV SOURCE AND ERROR CONTROL CODING
Entropy, Source encoding theorem, Shannon fano coding, Huffman coding, mutual information, channel capacity, channel coding theorem, Error Control Coding, linear block codes, cyclic codes, convolution codes, viterbi decoding algorithm.
UNIT V  MULTI-USER RADIO COMMUNICATION
Advanced Mobile Phone System (AMPS) - Global System for Mobile Communications (GSM) - Code division multiple access (CDMA) – Cellular Concept and Frequency Reuse - Channel Assignment and Hand off - Overview of Multiple Access Schemes - Satellite Communication - Bluetooth.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Apply analog and digital communication techniques.
- Use data and pulse communication techniques.
- Analyze Source and Error control coding.
- Utilize multi-user radio communication.

TEXT BOOK:

REFERENCES:

GE6351  ENVIRONMENTAL SCIENCE AND ENGINEERING
OBJECTIVES:
To the study of nature and the 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 SO$_2$, NO$_x$, 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
UNIT V    HUMAN POPULATION AND THE ENVIRONMENT

Population growth, variation among nations – population explosion – family welfare programme –
welfare – Environmental impact analysis (EIA) - GIS - remote sensing - role of information technology in
environment and human health – Case studies.

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.

TEXT BOOKS:
   Education 2004.

REFERENCES:

IT6311 PROGRAMMING AND DATA STRUCTURE
L  T  P  C
LABORATORY II 0  0  3  2

OBJECTIVES:
The student should be made to:
- Be familiarized with good programming design methods, particularly Top-Down design.
- Getting exposure in implementing the different data structures using C++
- Appreciate recursive algorithms.

LIST OF EXPERIMENTS:
IMPLEMENTATION IN THE FOLLOWING TOPICS:
1. Constructors & Destructors, Copy Constructor.
2. Friend Function & Friend Class.
3. Inheritance.
4. Polymorphism & Function Overloading.
5. Virtual Functions.
6. Overload Unary & Binary Operators Both as Member Function & Non Member Function.
7. Class Templates & Function Templates.
8. Exception Handling Mechanism.
10. File Stream classes.
11. Applications of Stack and Queue
12. Binary Search Tree
13. Tree traversal Techniques
14. Minimum Spanning Trees
15. Shortest Path Algorithms

TOTAL: 45 PERIODS

REFERENCE:
spoken-tutorial.org.

OUTCOMES:
At the end of the course, the student should be able to:
- Design and implement C++ programs for manipulating stacks, queues, linked lists, trees, and graphs.
- Apply good programming design methods for program development.
- Apply the different data structures for implementing solutions to practical problems.
- Develop recursive programs using trees and graphs.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
Standalone desktops with C++ compiler 30 Nos.
(or)
Server with C++ compiler supporting 30 terminals or more.

IT6312 DATABASE MANAGEMENT SYSTEMS LABORATORY

OBJECTIVES:
The student should be made to:
- Learn to create and use a database
- Be familiarized with a query language
- Have hands on experience on DDL Commands
- Have a good understanding of DML Commands and DCL commands
- Familiarize advanced SQL queries.
- Be Exposed to different applications

LIST OF EXPERIMENTS:
1. Creation of a database and writing SQL queries to retrieve information from the database.
2. Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.
3. Creation of Views, Synonyms, Sequence, Indexes, Save point.
4. Creating an Employee database to set various constraints.
5. Creating relationship between the databases.
7. Write a PL/SQL block to satisfy some conditions by accepting input from the user.
8. Write a PL/SQL block that handles all types of exceptions.
10. Creation of database triggers and functions
11. Mini project (Application Development using Oracle/ Mysql)
   a) Inventory Control System.
b) Material Requirement Processing.
c) Hospital Management System.
d) Railway Reservation System.
e) Personal Information System.
f) Web Based User Identification System.
g) Timetable Management System.
h) Hotel Management System

REFERENCE:
spoken-tutorial.org

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
  • Design and implement a database schema for a given problem-domain
  • Populate and query a database
  • Create and maintain tables using PL/SQL.
  • Prepare reports.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

HARDWARE:
Standalone desktops  30 Nos.
(or)
Server supporting 30 terminals or more.

SOFTWARE:
Front end: VB/VC ++/JAVA or Equivalent
Back end: Oracle / SQL / MySQL/ PostGress / DB2 or Equivalent

IT6313 DIGITAL COMMUNICATION LABORATORY

OBJECTIVES:
The purpose of this lab is to explore digital communications with a software radio to understand how each component works together. The lab will cover, analog to digital conversion, modulation, pulse shaping, and noise analysis.

LIST OF EXPERIMENTS

EXPERIMENTS IN THE FOLLOWING TOPICS:
  1. Signal Sampling and reconstruction
  2. Amplitude modulation and demodulation
  3. Frequency modulation and demodulation
  4. Pulse code modulation and demodulation.
  5. Delta modulation, adaptive delta Modulation
  6. Line Coding Schemes
  7. BFSK modulation and Demodulation (Hardware(Kit based) & Simulation using MATLAB / SCILAB / Equivalent)
  8. BPSK modulation and Demodulation (Hardware& Simulation using MATLAB/SCILAB/ Equivalent)
  9. FSK, PSK and DPSK schemes (Simulation)
  10. Error control coding schemes (Simulation)
11. Spread spectrum communication (Simulation)
12. Communication link simulation
13. TDM and FDM

TOTAL: 45 PERIODS

OUTCOME:
To develop necessary skill in designing, analyzing and constructing digital electronic circuits.

LAB FREQUIREMENT FOR A BATCH OF 30 STUDENTS, 3 STUDENTS / EXPERIMENT:
i) Kits for Signal Sampling, TDM, AM, FM, PCM, DM and Line Coding Schemes
ii) Software Defined Radio platform for link simulation studies
iii) MATLAB / SCILAB for simulation experiments
iv) PCs - 10 Nos
v) Signal generator / Function generators / Power Supply / CRO / Bread Board each -15 nos

MA6453   PROBABILITY AND QUEUEING THEORY

OBJECTIVES:
To provide the required mathematical support in real life problems and develop probabilistic models which can be used in several areas of science and engineering.

UNIT I    RANDOM VARIABLES
Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions.

UNIT II   TWO-DIMENSIONAL RANDOM VARIABLES
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables.

UNIT III  RANDOM PROCESSES

UNIT IV   QUEUEING MODELS
Markovian queues – Birth and Death processes – Single and multiple server queueing models – Little’s formula - Queues with finite waiting rooms – Queues with impatient customers: Balking and reneging.

UNIT V    ADVANCED QUEUEING MODELS
Finite source models - M/G/1 queue – Pollaczek Khinchin formula - M/D/1 and M/E_k/1 as special cases - Series queues – Open Jackson networks.

OUTCOMES:
• The students will have a fundamental knowledge of the probability concepts.
• Acquire skills in analyzing queueing models.
• It also helps to understand and characterize phenomenon which evolve with respect to time in a probabilistic manner.
TEXT BOOKS:

REFERENCES:

EC6504 MICROPROCESSOR AND MICROCONTROLLER L T P C

OBJECTIVES:
The student should be made to:
- Study the Architecture of 8086 microprocessor.
- Learn the design aspects of I/O and Memory Interfacing circuits.
- Study about communication and bus interfacing.
- Study the Architecture of 8051 microcontroller.

UNIT I THE 8086 MICROPROCESSOR
Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

UNIT II 8086 SYSTEM BUS STRUCTURE

UNIT III I/O INTERFACING

UNIT IV MICROCONTROLLER
Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.
UNIT V  INTERFACING MICROCONTROLLER

OUTCOMES:
At the end of the course, the student should be able to:
- Design and implement programs on 8086 microprocessor.
- Design I/O circuits.
- Design Memory Interfacing circuits.
- Design and implement 8051 microcontroller based systems.

TEXT BOOKS:

REFERENCE:
1. Doughlas V.Hall, “Microprocessors and Interfacing, Programming and Hardware”, TMH,2012

CS6402  DESIGN AND ANALYSIS OF ALGORITHMS
L  T  P  C
3   0  0  3

OBJECTIVES:
The student should be made to:
- Learn the algorithm analysis techniques.
- Become familiar with the different algorithm design techniques.
- Understand the limitations of Algorithm power.

UNIT I  INTRODUCTION

UNIT II  BRUTE FORCE AND DIVIDE-AND-CONQUER

UNIT III  DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE

UNIT IV  ITERATIVE IMPROVEMENT
UNIT V  COPING WITH THE LIMITATIONS OF ALGORITHM POWER


TOTAL: 45 PERIODS

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

- Design algorithms for various computing problems.
- Analyze the time and space complexity of algorithms.
- Critically analyze the different algorithm design techniques for a given problem.
- Modify existing algorithms to improve efficiency.

TEXT BOOK:

REFERENCES:
4. http://nptel.ac.in/

CS6401 OPERATING SYSTEMS L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:

- Study the basic concepts and functions of operating systems.
- Understand the structure and functions of OS.
- Learn about Processes, Threads and Scheduling algorithms.
- Understand the principles of concurrency and Deadlocks.
- Learn various memory management schemes.
- Study I/O management and File systems.
- Learn the basics of Linux system and perform administrative tasks on Linux Servers.

UNIT I OPERATING SYSTEMS OVERVIEW

UNIT II  PROCESS MANAGEMENT  9

UNIT III  STORAGE MANAGEMENT  9
Main Memory-Contiguous Memory Allocation, Segmentation, Paging, 32 and 64 bit architecture Examples; Virtual Memory- Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory, OS Examples.

UNIT IV  I/O SYSTEMS  9

UNIT V  CASE STUDY  9
Linux System- Basic Concepts; System Administration-Requirements for Linux System Administrator, Setting up a LINUX Multifunction Server, Domain Name System, Setting Up Local Network Services; Virtualization- Basic Concepts, Setting Up Xen,VMware on Linux Host and Adding Guest OS.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Design various Scheduling algorithms.
- Apply the principles of concurrency.
- Design deadlock, prevention and avoidance algorithms.
- Compare and contrast various memory management schemes.
- Design and Implement a prototype file systems.
- Perform administrative tasks on Linux Servers.

TEXT BOOK:

REFERENCES:
5. http://nptel.ac.in/
OBJECTIVES:
The student should be made to:

- Understand the phases in a software project
- Understand fundamental concepts of requirements engineering and Analysis Modelling.
- Understand the major considerations for enterprise integration and deployment.
- Learn various testing and maintenance measures

UNIT I SOFTWARE PROCESS AND PROJECT MANAGEMENT 9

UNIT II REQUIREMENTS ANALYSIS AND SPECIFICATION 9

UNIT III SOFTWARE DESIGN 9

UNIT IV TESTING AND IMPLEMENTATION 9

UNIT V PROJECT MANAGEMENT 9

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

- Identify the key activities in managing a software project.
- Compare different process models.
- Concepts of requirements engineering and Analysis Modeling.
- Apply systematic procedure for software design and deployment.
- Compare and contrast the various testing and maintenance

TEXT BOOKS:
REFERENCES:

IT6411 MICROPROCESSOR AND MICROCONTROLLER LABORATORY

OBJECTIVES:
The student should be made to:
• Introduce ALP concepts and features
• Write ALP for arithmetic and logical operations in 8086 and 8051
• Differentiate Serial and Parallel Interface
• Interface different I/Os with Microprocessors
• Be familiar with MASM

LIST OF EXPERIMENTS:
8086 Programs using kits and MASM
1. Basic arithmetic and Logical operations
2. Move a data block without overlap
3. Code conversion, decimal arithmetic and Matrix operations.
4. Floating point operations, string manipulations, sorting and searching
5. Password checking, Print RAM size and system date
6. Counters and Time Delay

Peripherals and Interfacing Experiments
7. Traffic light control
8. Stepper motor control
9. Digital clock
10. Key board and Display
11. Printer status
12. Serial interface and Parallel interface
13. A/D and D/A interface and Waveform Generation

8051 Experiments using kits and MASM
14. Basic arithmetic and Logical operations
15. Square and Cube program, Find 2’s complement of a number
16. Unpacked BCD to ASCII

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• Write ALP Programmes for fixed and Floating Point and Arithmetic
• Interface different I/Os with processor
• Generate waveforms using Microprocessors
• Execute Programs in 8051
• Explain the difference between simulator and Emulator
LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:

HARDWARE:
- 8086 development kits - 30 nos
- Interfacing Units - Each 10 nos
- Microcontroller - 30 nos

SOFTWARE:
- Intel Desktop Systems with MASM - 30 nos
- 8086 Assembler
- 8051 Cross Assembler

IT6412 OPERATING SYSTEMS LABORATORY

OBJECTIVES:
The student should be made to:
- Learn shell programming and the use of filters in the UNIX environment.
- Be exposed to programming in C using system calls.
- Learn to use the file system related system calls.
- Be exposed to process creation and inter process communication.
- Be familiar with implementation of CPU Scheduling Algorithms, page replacement algorithms and Deadlock avoidance

LIST OF EXPERIMENTS:
2. Shell Programming.
3. Implement the following CPU scheduling algorithms
   a) Round Robin b) SJF c) FCFS d) Priority
4. Implement all file allocation strategies
   a) Sequential b) Indexed c) Linked
5. Implement Semaphores
6. Implement all File Organization Techniques
   a) Single level directory b) Two level c) Hierarchical d) DAG
7. Implement Bankers Algorithm for Dead Lock Avoidance
8. Implement an Algorithm for Dead Lock Detection
9. Implement all page replacement algorithms
   a) FIFO b) LRU c) LFU
10. Implement Shared memory and IPC
11. Implement Paging Technique of memory management.
12. Implement Threading & Synchronization Applications

TOTAL: 45 PERIODS

REFERENCE:
spoken-tutorial.org

OUTCOMES:
At the end of the course, the student should be able to
- Implement deadlock avoidance, and Detection Algorithms
- Compare the performance of various CPU Scheduling Algorithm
- Critically analyze the performance of the various page replacement algorithms
- Create processes and implement IPC
LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:
Standalone desktops with C / C++ / Java / Equivalent complier 30 Nos.
(or)
Server with C / C++ / Java / Equivalent complier supporting 30 terminals or more.

IT6413 SOFTWARE ENGINEERING LABORATORY

OBJECTIVES:
- To understand the software engineering methodologies for project development.
- To gain knowledge about open source tools for Computer Aided Software Engineering.
- To develop an efficient software using case tools.

SOFTWARE REQUIRED:
Open source Tools: StarUML / UMLGraph / Topcased
Prepare the following documents for each experiment and develop the software using software engineering methodology.

1. **Problem Analysis and Project Planning** - Thorough study of the problem – Identify Project scope, Objectives and Infrastructure.
2. **Software Requirement Analysis** - Describe the individual Phases/modules of the project and Identify deliverables.
3. **Data Modelling** - Use work products – data dictionary, use case diagrams and activity diagrams, build and test class diagrams, sequence diagrams and add interface to class diagrams.
4. **Software Development and Debugging** – implement the design by coding
5. **Software Testing** - Prepare test plan, perform validation testing, coverage analysis, memory leaks, develop test case hierarchy, Site check and site monitor.

Sample Experiments:
Academic domain
1. Course Registration System
2. Student marks analysing system
Railway domain
3. Online ticket reservation system
4. Platform assignment system for the trains in a railway station
Medicine domain
5. Expert system to prescribe the medicines for the given symptoms
6. Remote computer monitoring
Finance domain
7. ATM system
8. Stock maintenance
Human Resource management
9. Quiz System
10. E-mail Client system.

TOTAL: 45 PERIODS
OUTCOMES:
Upon Completion of the course, the students should be able to:
- Use open source case tools to develop software.
- Analyze and design software requirements in efficient manner.

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:
SOFTWARE:
Argo UML / StarUML / UMLGraph / Topcased or Equivalent.

HARDWARE:
Standalone desktops 30 Nos

CS6551 COMPUTER NETWORKS

OBJECTIVES:
The student should be made to:
- Understand the division of network functionalities into layers.
- Be familiar with the components required to build different types of networks
- Be exposed to the required functionality at each layer
- Learn the flow control and congestion control algorithms

UNIT I FUNDAMENTALS & LINK LAYER
Building a network – Requirements - Layering and protocols - Internet Architecture – Network software – Performance ; Link layer Services - Framing - Error Detection - Flow control

UNIT II MEDIA ACCESS & INTERNETWORKING
Media access control - Ethernet (802.3) - Wireless LANs – 802.11 – Bluetooth - Switching and bridging – Basic Internetworking (IP, CIDR, ARP, DHCP,ICMP )

UNIT III ROUTING
Routing (RIP, OSPF, metrics) – Switch basics – Global Internet (Areas, BGP, IPv6), Multicast – addresses – multicast routing (DVMRP, PIM)

UNIT IV TRANSPORT LAYER
Overview of Transport layer - UDP - Reliable byte stream (TCP) - Connection management - Flow control - Retransmission – TCP Congestion control - Congestion avoidance (DECbit, RED) – QoS – Application requirements

UNIT V APPLICATION LAYER
Traditional applications - Electronic Mail (SMTP, POP3, IMAP, MIME) – HTTP – Web Services – DNS - SNMP

OUTCOMES:
At the end of the course, the student should be able to:
- Identify the components required to build different types of networks
- Choose the required functionality at each layer for given application
- Identify solution for each functionality at each layer
- Trace the flow of information from one node to another node in the network

TOTAL: 45 PERIODS
TEXT BOOK:

REFERENCES:

IT6501 GRAPHICS AND MULTIMEDIA L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
• Develop an understanding and awareness of how issues such as content, information architecture, motion, sound, design, and technology merge to form effective and compelling interactive experiences for a wide range of audiences and end users.
• Be familiar with various software programs used in the creation and implementation of multimedia (interactive, motion/animation, presentation, etc.).
• Be aware of current issues relative between new emerging electronic technologies and graphic design (i.e. social, cultural, cognitive, etc).
• Understand the relationship between critical analysis and the practical application of design.
• Appreciate the importance of technical ability and creativity within design practice.

UNIT I OUTPUT PRIMITIVES 9

UNIT II THREE-DIMENSIONAL CONCEPTS 9

UNIT III MULTIMEDIA SYSTEMS DESIGN 9

UNIT IV MULTIMEDIA FILE HANDLING 9
UNIT V HYPERMEDIA
Multimedia authoring and user interface – Hypermedia messaging – Mobile messaging –
Hypermedia message component – Creating hypermedia message – Integrated multimedia
message standards – Integrated document management – Distributed multimedia systems.

OUTCOMES:
Upon completion of the course, the student should be able to:
• Effectively and creatively solve a wide range of graphic design problems
• Form effective and compelling interactive experiences for a wide range of audiences.
• Use various software programs used in the creation and implementation of multi-media
  (interactive, motion/animation, presentation, etc.).
• Discuss issues related to emerging electronic technologies and graphic design

TEXT BOOKS:

REFERENCES:

CS6502 OBJECT ORIENTED ANALYSIS AND DESIGN

OBJECTIVES:
The student should be made to:
• Learn the basics of OO analysis and design skills
• Learn the UML design diagrams
• Learn to map design to code
• Be exposed to the various testing techniques.

UNIT I UML DIAGRAMS
Introduction to OOAD – Unified Process - UML diagrams – Use Case – Class Diagrams– Interaction
Diagrams – State Diagrams – Activity Diagrams – Package, component and Deployment Diagrams

UNIT II DESIGN PATTERNS
GRASP: Designing objects with responsibilities – Creator – Information expert – Low Coupling – High
Cohesion – Controller - Design Patterns – creational - factory method - structural – Bridge – Adapter -
behavioral – Strategy – observer

UNIT III CASE STUDY
Case study – the Next Gen POS system, Inception -Use case Modeling - Relating Use cases –
include, extend and generalization - Elaboration - Domain Models - Finding conceptual classes and
description classes – Associations – Attributes – Domain model refinement – Finding conceptual class
Hierarchies - Aggregation and Composition
UNIT IV APPLING DESIGN PATTERNS
System sequence diagrams - Relationship between sequence diagrams and use cases Logical architecture and UML package diagram – Logical architecture refinement - UML class diagrams - UML interaction diagrams - Applying GoF design patterns

UNIT V CODING AND TESTING

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• Design and implement projects using OO concepts
• Use the UML analysis and design diagrams
• Apply appropriate design patterns
• Create code from design
• Compare and contrast various testing techniques

TEXT BOOK:

REFERENCES:

IT6502 DIGITAL SIGNAL PROCESSING L T P C
3 1 0 4

OBJECTIVES:
• To introduce discrete Fourier transform and its applications.
• To teach the design of infinite and finite impulse response filters for filtering undesired signals.
• To introduce signal processing concepts in systems having more than one sampling frequency.

UNIT I SIGNALS AND SYSTEMS

UNIT II FREQUENCY TRANSFORMATIONS
UNIT III   IIR FILTER DESIGN
Structures of IIR – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives – (LPF, HPF, BPF, BRF) filter design using frequency translation.

UNIT IV   FIR FILTER DESIGN
Structures of FIR – Linear phase FIR filter – Fourier Series - Filter design using windowing techniques (Rectangular Window, Hamming Window, Hanning Window), Frequency sampling techniques

UNIT V   FINITE WORD LENGTH EFFECTS IN DIGITAL FILTERS
Binary fixed point and floating point number representations – Comparison - Quantization noise – truncation and rounding – quantization noise power- input quantization error- coefficient quantization error – limit cycle oscillations-dead band- Overflow error-signal scaling.

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

OUTCOMES:
Upon completion of the course, students will be able to
- Perform frequency transforms for the signals.
- Design IIR and FIR filters.
- Finite word length effects in digital filters

TEXT BOOK:

REFERENCES:

IT6503   WEB PROGRAMMING

OBJECTIVES:
The student should be made to:
- Understand the technologies used in Web Programming.
- Know the importance of object oriented aspects of Scripting.
- Understand creating database connectivity using JDBC.
- Learn the concepts of web based application using sockets.

UNIT I   SCRIPTING.
Web page Designing using HTML, Scripting basics- Client side and server side scripting, Java Script-Object, names, literals, operators and expressions- statements and features- events - windows - documents - frames - data types - built-in functions- Browser object model - Verifying forms.-HTML5-CSS3- HTML 5 canvas - Web site creation using tools.
UNIT II  JAVA

UNIT III  JDBC
JDBC Overview – JDBC implementation – Connection class – Statements - Catching Database Results, handling database Queries. Networking– InetAddress class – URL class- TCP sockets - UDP sockets, Java Beans –RMI.

UNIT IV  APPLETS

UNIT V  XML AND WEB SERVICES

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

OUTCOMES:
Upon Completion of the course, the students will be able to
- Design web pages.
- Use technologies of Web Programming.
- Apply object oriented aspects to Scripting.
- Create databases with connectivity using JDBC.
- Build web based application using sockets.

TEXT BOOKS:
3. Michael Morrison XML Unleashed Tech media SAMS.

REFERENCES:

EC6801  WIRELESS COMMUNICATION

OBJECTIVES:
The student should be made to:
- Know the characteristic of wireless channel
- Learn the various cellular architectures
- Understand the concepts behind various digital signaling schemes for fading channels
- Be familiar the various multipath mitigation techniques
- Understand the various multiple antenna systems
UNIT I  WIRELESS CHANNELS

UNIT II  CELLULAR ARCHITECTURE
Multiple Access techniques - FDMA, TDMA, CDMA – Capacity calculations–Cellular concept- Frequency reuse - channel assignment- hand off- interference & system capacity- trunking & grade of service – Coverage and capacity improvement.

UNIT III  DIGITAL SIGNALING FOR FADING CHANNELS
Structure of a wireless communication link, Principles of Offset-QPSK, p/4-DQPSK, Minimum Shift Keying, Gaussian Minimum Shift Keying, Error performance in fading channels, OFDM principle – Cyclic prefix, Windowing, PAPR.

UNIT IV  MULTIPATH MITIGATION TECHNIQUES
Equalisation – Adaptive equalization, Linear and Non-Linear equalization, Zero forcing and LMS Algorithms. Diversity – Micro and Macrodiversity, Diversity combining techniques, Error probability in fading channels with diversity reception, Rake receiver,

UNIT V  MULTIPLE ANTENNA TECHNIQUES
MIMO systems – spatial multiplexing -System model -Pre-coding - Beam forming - transmitter diversity, receiver diversity- Channel state information-capacity in fading and non-fading channels.

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Characterize wireless channels
- Design and implement various signaling schemes for fading channels
- Design a cellular system
- Compare multipath mitigation techniques and analyze their performance
- Design and implement systems with transmit/receive diversity and MIMO systems and analyze their performance

TEXTBOOKS:

REFERENCES:
OBJECTIVES:
The student should be made to:
- Learn socket programming.
- Be familiar with simulation tools.
- Have hands on experience on various networking protocols.

LIST OF EXPERIMENTS:
1. Implementation of Stop and Wait Protocol and Sliding Window Protocol.
2. Study of Socket Programming and Client – Server model
3. Write a code simulating ARP /RARP protocols.
4. Write a code simulating PING and TRACEROUTE commands
5. Create a socket for HTTP for web page upload and download.
6. Write a program to implement RPC (Remote Procedure Call)
7. Implementation of Subnetting
8. Applications using TCP Sockets like
   a. Echo client and echo server
   b. Chat
   c. File Transfer
9. Applications using TCP and UDP Sockets like
   d. DNS
   e. SNMP
   f. File Transfer
10. Study of Network simulator (NS).and Simulation of Congestion Control Algorithms using NS
11. Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer.
   i. Link State routing
   ii. Flooding
   iii. Distance vector

TOTAL: 45 PERIODS

REFERENCE:
spoken-tutorial.org

OUTCOMES:
At the end of the course, the student should be able to
- Use simulation tools
- Implement the various protocols.
- Analyse the performance of the protocols in different layers.
- Analyze various routing algorithms

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS
SOFTWARE
- C / C++ / Java / Equivalent Compiler 30
- Network simulator like NS2/Glomosim/OPNET/ Equivalent

HARDWARE
- Standalone desktops 30 Nos
OBJECTIVES:
The student should be made to:
- Be familiar with Web page design using HTML / DHTML and style sheets
- Be exposed to creation of user interfaces using Java frames and applets.
- Learn to create dynamic web pages using server side scripting.
- Learn to write PHP database functions.
- Learn .Net framework and RMI.

LIST OF EXPERIMENTS:
1. Write a html program for Creation of web site with forms, frames, links, tables etc.
2. Design a web site using HTML and DHTML. Use Basic text Formatting, Images,
3. Create a script that asks the user for a name, then greets the user with "Hello" and
   the user name on the page.
4. Create a script that collects numbers from a page and then adds them up and
   prints them to a blank field on the page.
5. Create a script that prompts the user for a number and then counts from 1 to that
   number displaying only the odd numbers.
6. Create a script that will check the field in Assignment 1 for data and alert the user
   if it is blank. This script should run from a button.
7. Using CSS for creating web sites
8. Creating simple application to access data base using JDBC Formatting HTML with CSS.
9. Program for manipulating Databases and SQL.
11. Write a web application that functions as a simple hand calculator, but also keeps
    a "paper trail" of all your previous work
12. Install Tomcat and use JSP and link it with any of the assignments above
13. Reading and Writing the files using .Net
14. Write a program to implement web service for calculator application
15. Implement RMI concept for building any remote method of your choice.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to
- Design Web pages using HTML/DHTML and style sheets
- Design and Implement database applications.
- Create dynamic web pages using server side scripting.
- Write Client Server applications.

LAB REQUIREMENTS FOR A BATCH OF 30 STUDENTS:
SOFTWARE:
Java, Dream Weaver or Equivalent, MySQL or Equivalent, Apache Server

HARDWARE:
Standalone desktops 30 Nos
OBJECTIVES:
The student should be made to:
- Learn the basics of OO analysis and design skills.
- Be exposed to the UML design diagrams.
- Learn to map design to code.
- Be familiar with the various testing techniques

LIST OF EXPERIMENTS:
To develop a mini-project by following the 9 exercises listed below.
1. To develop a problem statement.
2. Identify Use Cases and develop the Use Case model.
3. Identify the conceptual classes and develop a domain model with UML Class diagram.
4. Using the identified scenarios, find the interaction between objects and represent them using UML Sequence diagrams.
5. Draw relevant state charts and activity diagrams.
6. Identify the User Interface, Domain objects, and Technical services. Draw the partial layered, logical architecture diagram with UML package diagram notation.
7. Develop and test the Technical services layer.
8. Develop and test the Domain objects layer.
9. Develop and test the User interface layer.

Suggested domains for Mini-Project:
1. Passport automation system.
2. Book bank
3. Exam Registration
4. Stock maintenance system.
5. Online course reservation system
6. E-ticketing
7. Software personnel management system
8. Credit card processing
9. e-book management system
10. Recruitment system
11. Foreign trading system
12. Conference Management System
13. BPO Management System
14. Library Management System
15. Student Information System

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to
- Design and implement projects using OO concepts.
- Use the UML analysis and design diagrams.
- Apply appropriate design patterns.
- Create code from design.
- Compare and contrast various testing techniques

LAB EQUIPMENTS FOR A BATCH OF 30 STUDENTS:
SUGGESTED SOFTWARE TOOLS:
Rational Suite (or) Argo UML (or) equivalent, Eclipse IDE and Junit
SOFTWARE TOOLS
Rational Suite
Open Source Alternatives: ArgoUML, Visual Paradigm
Eclipse IDE and JUnit

PCs

CS6601 DISTRIBUTED SYSTEMS

OBJECTIVES:
The student should be made to:
- Understand foundations of Distributed Systems
- Introduce the idea of peer to peer services and file system
- Understand in detail the system level and support required for distributed system
- Understand the issues involved in studying process and resource management

UNIT I INTRODUCTION

UNIT II COMMUNICATION IN DISTRIBUTED SYSTEM

UNIT III PEER TO PEER SERVICES AND FILE SYSTEM

UNIT IV SYNCHRONIZATION AND REPLICATION

UNIT V PROCESS & RESOURCE MANAGEMENT

TOTAL: 45 PERIODS
OUTCOMES:
At the end of the course, the student should be able to:
- Discuss trends in Distributed Systems.
- Apply network virtualization.
- Apply remote method invocation and objects.
- Design process and resource management systems.

TEXT BOOK:

REFERENCES:

IT6601  MOBILE COMPUTING  L  T  P  C
3  0  0  3

OBJECTIVES:
The student should be made to:
- Understand the basic concepts of mobile computing.
- Be familiar with the network protocol stack.
- Learn the basics of mobile telecommunication system.
- Be exposed to Ad-Hoc networks.
- Gain knowledge about different mobile platforms and application development.

UNIT I  INTRODUCTION

UNIT II  MOBILE INTERNET PROTOCOL AND TRANSPORT LAYER

UNIT III  MOBILE TELECOMMUNICATION SYSTEM
Global System for Mobile Communication (GSM) – General Packet Radio Service (GPRS) – Universal Mobile Telecommunication System (UMTS).

UNIT IV  MOBILE AD-HOC NETWORKS
UNIT V  MOBILE PLATFORMS AND APPLICATIONS


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

- Explain the basics of mobile telecommunication system
- Choose the required functionality at each layer for given application
- Identify solution for each functionality at each layer
- Use simulator tools and design Ad hoc networks
- Develop a mobile application.

TEXT BOOK:

REFERENCES:
8. Windows Phone Dev Center : http://developer.windowsphone.com

CS6659  ARTIFICIAL INTELLIGENCE  L T P C  3 0 0 3

OBJECTIVES:
The student should be made to:

- Study the concepts of Artificial Intelligence.
- Learn the methods of solving problems using Artificial Intelligence.
- Introduce the concepts of Expert Systems and machine learning.

UNIT I  INTRODUCTION TO AI AND PRODUCTION SYSTEMS
Introduction to AI-Problem formulation, Problem Definition -Production systems, Control strategies, Search strategies. Problem characteristics, Production system characteristics -Specialized production system- Problem solving methods - Problem graphs, Matching, Indexing and Heuristic functions -Hill Climbing-Depth first and Breath first, Constraints satisfaction - Related algorithms, Measure of performance and analysis of search algorithms.
UNIT II  REPRESENTATION OF KNOWLEDGE  9
Game playing - Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic-Structured representation of knowledge.

UNIT III  KNOWLEDGE INFERENCE  9
Knowledge representation -Production based system, Frame based system. Inference - Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian Theory-Bayesian Network-Dempster - Shafer theory.

UNIT IV  PLANNING AND MACHINE LEARNING  9

UNIT V  EXPERT SYSTEMS  9

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Identify problems that are amenable to solution by AI methods.
- Identify appropriate AI methods to solve a given problem.
- Formalise a given problem in the language/framework of different AI methods.
- Implement basic AI algorithms.
- Design and carry out an empirical evaluation of different algorithms on a problem formalisation, and state the conclusions that the evaluation supports.

TEXT BOOKS:

REFERENCES:
4. http://nptel.ac.in/

CS6660  COMPILER DESIGN  L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- Learn the design principles of a Compiler.
- Learn the various parsing techniques and different levels of translation.
- Learn how to optimize and effectively generate machine codes.
UNIT I  INTRODUCTION TO COMPILERS  
Translators-Compilation and Interpretation-Language processors -The Phases of Compiler-Errors Encountered in Different Phases-The Grouping of Phases-Compiler Construction Tools - Programming Language basics.

UNIT II  LEXICAL ANALYSIS  
Need and Role of Lexical Analyzer-Lexical Errors-Expressing Tokens by Regular Expressions- Converting Regular Expression to DFA- Minimization of DFA-Language for Specifying Lexical Analyzers-LEX-Design of Lexical Analyzer for a sample Language.

UNIT III  SYNTAX ANALYSIS  

UNIT IV  SYNTAX DIRECTED TRANSLATION & RUN TIME ENVIRONMENT  
Syntax directed Definitions-Construction of Syntax Tree-Bottom-up Evaluation of S-Attribute Definitions- Design of predictive translator - Type Systems-Specification of a simple type checker- Equivalence of Type Expressions-Type Conversions.

RUN-TIME ENVIRONMENT: Source Language Issues-Storage Organization-Storage Allocation- Parameter Passing-Symbol Tables-Dynamic Storage Allocation-Storage Allocation in FORTAN.

UNIT V  CODE OPTIMIZATION AND CODE GENERATION  

TOTAL: 45 PERIODS

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

- Design and implement a prototype compiler.
- Apply the various optimization techniques.
- Use the different compiler construction tools.

TEXTBOOK:

REFERENCES:
OBJECTIVES:
- Understand software architectural requirements and drivers
- Be exposed to architectural styles and views
- Be familiar with architectures for emerging technologies

UNIT I  INTRODUCTION AND ARCHITECTURAL DRIVERS

UNIT II  QUALITY ATTRIBUTE WORKSHOP
Quality Attribute Workshop – Documenting Quality Attributes – Six part scenarios – Case studies.

UNIT III  ARCHITECTURAL VIEWS

UNIT IV  ARCHITECTURAL STYLES
Introduction – Data flow styles – Call-return styles – Shared Information styles - Event styles – Case studies for each style.

UNIT V  DOCUMENTING THE ARCHITECTURE
Good practices – Documenting the Views using UML – Merits and Demerits of using visual languages – Need for formal languages - Architectural Description Languages – ACME – Case studies. Special topics: SOA and Web services – Cloud Computing – Adaptive structures

OUTCOMES:
Upon Completion of the course, the students will be able to
- Explain influence of software architecture on business and technical activities
- Identify key architectural structures
- Use styles and views to specify architecture
- Design document for a given architecture

TEXT BOOKS:

REFERENCES:

IT6611 MOBILE APPLICATION DEVELOPMENT LABORATORY

OBJECTIVES:
The student should be made to:
• Know the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
• Understand how to work with various mobile application development frameworks.
• Learn the basic and important design concepts and issues of development of mobile applications.
• Understand the capabilities and limitations of mobile devices.

LIST OF EXPERIMENTS
1. Develop an application that uses GUI components, Font and Colours
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Develop an application that makes use of RSS Feed.
7. Implement an application that implements Multi threading
8. Develop a native application that uses GPS location information.
9. Implement an application that writes data to the SD card.
10. Implement an application that creates an alert upon receiving a message.
11. Write a mobile application that creates alarm clock

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• Design and Implement various mobile applications using emulators.
• Deploy applications to hand-held devices

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS
Standalone desktops with Windows or Android or iOS or Equivalent Mobile Application Development Tools with appropriate emulators and debuggers - 30 Nos.

IT6612 COMPILER LABORATORY

OBJECTIVES:
The student should be made to:
• Be exposed to compiler writing tools.
• Learn to implement the different Phases of compiler
• Be familiar with control flow and data flow analysis
• Learn simple optimization techniques
LIST OF EXPERIMENTS:
1. Implementation of Symbol Table
2. Develop a lexical analyzer to recognize a few patterns in C.  
   (Ex. identifiers, constants, comments, operators etc.)
3. Implementation of Lexical Analyzer using Lex Tool
4. Generate YACC specification for a few syntactic categories.
   a) Program to recognize a valid arithmetic expression that uses operator +, -, *, and /.
   b) Program to recognize a valid variable which starts with a letter followed by any number of letters or digits.
   d) Implementation of Calculator using LEX and YACC
5. Convert the BNF rules into Yacc form and write code to generate Abstract Syntax Tree.
6. Implement type checking
7. Implement control flow analysis and Data flow Analysis
8. Implement any one storage allocation strategies (Heap, Stack, Static)
9. Construction of DAG
10. Implement the back end of the compiler which takes the three address code and produces the 8086 assembly language instructions that can be assembled and run using a 8086 assembler. The target assembly instructions can be simple move, add, sub, jump. Also simple addressing modes are used.
11. Implementation of Simple Code Optimization Techniques (Constant Folding, etc.)

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to
- Implement the different Phases of compiler using tools
- Analyze the control flow and data flow of a typical program
- Optimize a given program
- Generate an assembly language program equivalent to a source language program

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
Standalone desktops with C / C++ compiler and Compiler writing tools 30 Nos.
(or)
Server with C / C++ compiler and Compiler writing tools supporting 30 terminals or more.
LEX and YACC

GE6674  COMMUNICATION AND SOFT SKILLS - LABORATORY BASED

OBJECTIVES:
- To enable learners to develop their communicative competence.
- To facilitate them to hone their soft skills.
- To equip them with employability skills to enhance their prospect of placements.

UNIT I  LISTENING AND SPEAKING SKILLS
Conversational skills (formal and informal) – group discussion and interview skills – making presentations.
Listening to lectures, discussions, talk shows, news programmes, dialogues from TV/radio/Ted talk/Podcast – watching videos on interesting events on Youtube.
UNIT II  READING AND WRITING SKILLS  12
Reading different genres of tests ranging from newspapers to philosophical treatises – reading
strategies such as graphic organizers, summarizing and interpretation.
for publications.

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) – Graduate Record Examination (GRE) – Civil Service (Language related) – Verbal ability.

UNIT IV  SOFT SKILLS (1)  12
Motivation – self image – goal setting – managing changes – time management – stress management
– leadership traits – team work – career and life planning.

UNIT V  SOFT SKILLS (2)  12
Multiple intelligences – emotional intelligence – spiritual quotient (ethics) – intercultural
communication – creative and critical thinking – learning styles and strategies.

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:

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<th>S. No.</th>
<th>Description of Equipment (minimum configuration)</th>
<th>Qty Required</th>
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<td>Server</td>
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<tr>
<td></td>
<td>• PIV System</td>
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<tr>
<td></td>
<td>• 1 GB RAM / 40 GB HDD</td>
<td></td>
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<tr>
<td></td>
<td>• OS: Win 2000 server</td>
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<tr>
<td></td>
<td>• Audio card with headphones</td>
<td></td>
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<td></td>
<td>• JRE 1.3</td>
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<tr>
<td>2</td>
<td>Client Systems</td>
<td>60 Nos.</td>
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<td>• PIII System</td>
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<tr>
<td></td>
<td>• 256 or 512 MB RAM / 40 GB HDD</td>
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<tr>
<td></td>
<td>• OS: Win 2000</td>
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<tr>
<td></td>
<td>• Audio card with headphones</td>
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<td>• JRE 1.3</td>
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<tr>
<td>3</td>
<td>Handicam</td>
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<tr>
<td>4</td>
<td>Television 46”</td>
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<tr>
<td>5</td>
<td>Collar mike</td>
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<tr>
<td>6</td>
<td>Cordless mike</td>
<td>1 No.</td>
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<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>
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<tr>
<td>9</td>
<td>LCD Projector with MP3/CD/DVD provision for Audio/video facility</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
- Online Test - 35 marks
- Interview - 15 marks
- Presentation - 15 marks
- Group Discussion - 15 marks

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, case studies and abstract concept.

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/doiTTeamN/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
OBJECTIVES:

- To expose students with the basics of managing the information
- To explore the various aspects of database design and modelling,
- To examine the basic issues in information governance and information integration
- To understand the overview of information architecture.

UNIT I DATABASE MODELLING, MANAGEMENT AND DEVELOPMENT 9
Database design and modelling - Business Rules and Relationship; Java database Connectivity (JDBC), Database connection Manager, Stored Procedures. Trends in Big Data systems including NoSQL - Hadoop HDFS, MapReduce, Hive, and enhancements.

UNIT II DATA SECURITY AND PRIVACY 9

UNIT III INFORMATION GOVERNANCE 9
Master Data Management (MDM) – Overview, Need for MDM, Privacy, regulatory requirements and compliance. Data Governance – Synchronization and data quality management.

UNIT IV INFORMATION ARCHITECTURE 9
Principles of Information architecture and framework, Organizing information, Navigation systems and Labelling systems, Conceptual design, Granularity of Content.

UNIT V INFORMATION LIFECYCLE MANAGEMENT 9
Data retention policies; Confidential and Sensitive data handling, lifecycle management costs. Archive data using Hadoop; Testing and delivering big data applications for performance and functionality; Challenges with data administration;

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course the students will be able to:

- Cover core relational database topics including logical and physical design and modeling
- Design and implement a complex information system that meets regulatory requirements; define and manage an organization's key master data entities
- Design, Create and maintain data warehouses.
- Learn recent advances in NOSQL, Big Data and related tools.

TEXT BOOKS:
1. Alex Berson, Larry Dubov MASTER DATA MANAGEMENT AND DATA GOVERNANCE, 2/E, Tata McGraw Hill, 2011
3. Information Architecture for the World Wide Web; Peter Morville, Louis Rosenfeld; O'Reilly Media; 1998

REFERENCES:
4. Inside Cyber Warfare: Mapping the Cyber Underworld- Jeffrey Carr, O'Reilly Media; Second Edition 2011
OBJECTIVES:
The student should be made to:

- Understand OSI security architecture and classical encryption techniques.
- Acquire fundamental knowledge on the concepts of finite fields and number theory.
- Understand various block cipher and stream cipher models.
- Describe the principles of public key cryptosystems, hash functions and digital signature.

UNIT I INTRODUCTION & NUMBER THEORY 10
Services, Mechanisms and attacks-the OSI security architecture-Network security model-Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, steganography). FINITE FIELDS AND NUMBER THEORY: Groups, Rings, Fields-Modular arithmetic-Euclid’s algorithm-Finite fields- Polynomial Arithmetic-Prime numbers-Fermat’s and Euler’s theorem-Testing for primality -The Chinese remainder theorem- Discrete logarithms.

UNIT II BLOCK CIPHERS & PUBLIC KEY CRYPTOGRAPHY 10

UNIT III HASH FUNCTIONS AND DIGITAL SIGNATURES 8

UNIT IV SECURITY PRACTICE & SYSTEM SECURITY 8

UNIT V E-MAIL, IP & WEB SECURITY 9

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students should be able to:

- Compare various Cryptographic Techniques
- Design Secure applications
- Inject secure coding in the developed applications
TEXT BOOKS:

REFERENCES:

IT6702 DATA WAREHOUSING AND DATA MINING L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- Be familiar with the concepts of data warehouse and data mining,
- Be acquainted with the tools and techniques used for Knowledge Discovery in Databases.

UNIT I DATA WAREHOUSING

UNIT II BUSINESS ANALYSIS

UNIT III DATA MINING

UNIT IV ASSOCIATION RULE MINING AND CLASSIFICATION
Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining various Kinds of Association Rules – Correlation Analysis – Constraint Based Association Mining – Classification and Prediction - Basic Concepts - Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction.
UNIT V CLUSTERING AND TRENDS IN DATA MINING


TOTAL: 45 PERIODS

OUTCOMES:
After completing this course, the student will be able to:
- Apply data mining techniques and methods to large data sets.
- Use data mining tools.
- Compare and contrast the various classifiers.

TEXT BOOKS:

REFERENCES:

CS6703 GRID AND CLOUD COMPUTING L T P C 3 0 0 3

OBJECTIVES:
The student should be made to:
- Understand how Grid computing helps in solving large scale scientific problems.
- Gain knowledge on the concept of virtualization that is fundamental to cloud computing.
- Learn how to program the grid and the cloud.
- Understand the security issues in the grid and the cloud environment.

UNIT I INTRODUCTION

UNIT II GRID SERVICES
UNIT III VIRTUALIZATION

Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: Everything as a service: Infrastructure, platform, software - Pros and Cons of cloud computing – Implementation levels of virtualization – virtualization structure – virtualization of CPU, Memory and I/O devices – virtual clusters and Resource Management – Virtualization for data center automation.

UNIT IV PROGRAMMING MODEL


UNIT V SECURITY

Trust models for Grid security environment – Authentication and Authorization methods – Grid security infrastructure – Cloud Infrastructure security: network, host and application level – aspects of data security, provider data and its security, Identity and access management architecture, IAM practices in the cloud, SaaS, PaaS, IaaS availability in the cloud, Key privacy issues in the cloud.

OUTCOMES:

At the end of the course, the student should be able to:

- Apply grid computing techniques to solve large scale scientific problems
- Apply the concept of virtualization
- Use the grid and cloud tool kits
- Apply the security models in the grid and the cloud environment

TOTAL: 45 PERIODS

TEXT BOOK:


REFERENCES:

1. Jason Venner, “Pro Hadoop - Build Scalable, Distributed Applications in the Cloud”, A Press, 2009
OBJECTIVES:
The student should be made to:
- Be familiar with the algorithms of data mining,
- Be acquainted with the tools and techniques used for Knowledge Discovery in Databases.
- Be exposed to web mining and text mining

LIST OF EXPERIMENTS:
1. Creation of a Data Warehouse.
2. Apriori Algorithm.
3. FP-Growth Algorithm.
5. One Hierarchical clustering algorithm.
6. Bayesian Classification.
7. Decision Tree.
8. Support Vector Machines.
9. Applications of classification for web mining.
10. Case Study on Text Mining or any commercial application.

TOTAL : 45 PERIODS

OUTCOMES:
After completing this course, the student will be able to:
- Apply data mining techniques and methods to large data sets.
- Use data mining tools.
- Compare and contrast the various classifiers.

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE:
WEKA, RapidMiner, DB Miner or Equivalent

HARDWARE
Standalone desktops 30 Nos

OBJECTIVES:
The student should be made to:
- Be exposed to the different cipher techniques
- Learn to implement the algorithms DES, RSA, MD5, SHA-1
- Learn to use tools like GnuPG, KF sensor, Net Strumbler

LIST OF EXPERIMENTS
1. Implement the following SUBSTITUTION & TRANSPOSITION TECHNIQUES concepts:
   a) Caesar Cipher
   b) Playfair Cipher
   c) Hill Cipher
   d) Vigenere Cipher
   e) Rail fence – row & Column Transformation
2. Implement the following algorithms
   a) DES
   b) RSA Algorithm
   c) Diffiee-Hellman
   d) MD5
   e) SHA-1
3. Implement the SIGNATURE SCHEME - Digital Signature Standard
4. Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (GnuPG).
5. Setup a honey pot and monitor the honeypot on network (KF Sensor)
6. Installation of rootkits and study about the variety of options
7. Perform wireless audit on an access point or a router and decrypt WEP and WPA. (Net Stumbler)
8. Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w)

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to
- Implement the cipher techniques
- Develop the various security algorithms
- Use different open source tools for network security and analysis

LAB EQUIPMENTS FOR A BATCH OF 30 STUDENTS:
SOFTWARE:
C / C++ / Java or equivalent compiler
GnuPG, KF Sensor or Equivalent, Snort, Net Stumbler or Equivalent
HARDWARE:
Standalone desktops - 30 Nos.
(or)
Server supporting 30 terminals or more.

IT6713 GRID AND CLOUD COMPUTING LABORATORY L T P C 0 0 3 2

OBJECTIVES:
The student should be made to:
- Be exposed to tool kits for grid and cloud environment.
- Be familiar with developing web services/Applications in grid framework
- Learn to run virtual machines of different configuration.
- Learn to use Hadoop

LIST OF EXPERIMENTS:
GRID COMPUTING LAB:
Use Globus Toolkit or equivalent and do the following:
1. Develop a new Web Service for Calculator.
2. Develop new OGSA-compliant Web Service.
4. Develop applications using Java or C/C++ Grid APIs
5. Develop secured applications using basic security mechanisms available in Globus Toolkit.
6. Develop a Grid portal, where user can submit a job and get the result. Implement it with and without GRAM concept.

CLOUD COMPUTING LAB:
Use Eucalyptus or Open Nebula or equivalent to set up the cloud and demonstrate.
1. Find procedure to run the virtual machine of different configuration. Check how many virtual machines can be utilized at particular time.
2. Find procedure to attach virtual block to the virtual machine and check whether it holds the data even after the release of the virtual machine.
3. Install a C compiler in the virtual machine and execute a sample program.
4. Show the virtual machine migration based on the certain condition from one node to the other.
5. Find procedure to install storage controller and interact with it.
6. Find procedure to set up the one node Hadoop cluster.
7. Mount the one node Hadoop cluster using FUSE.
8. Write a program to use the API's of Hadoop to interact with it.
9. Write a word count program to demonstrate the use of Map and Reduce tasks.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to
- Use the grid and cloud tool kits.
- Design and implement applications on the Grid.
- Design and Implement applications on the Cloud.

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:
SOFTWARE:
Globus Toolkit or equivalent
Eucalyptus or Open Nebula or equivalent to

HARDWARE
Standalone desktops 30 Nos

IT6801 SERVICE ORIENTED ARCHITECTURE
OBJECTIVES:
The student should be made to:
- Learn XML fundamentals.
- Be exposed to build applications based on XML.
- Understand the key principles behind SOA.
- Be familiar with the web services technology elements for realizing SOA.
- Learn the various web service standards.

UNIT I  INTRODUCTION TO XML
UNIT II BUILDING XML- BASED APPLICATIONS 9

UNIT III SERVICE ORIENTED ARCHITECTURE 9
Characteristics of SOA, Comparing SOA with Client-Server and Distributed architectures – Benefits of SOA -- Principles of Service orientation – Service layers.

UNIT IV WEB SERVICES 9

UNIT V BUILDING SOA-BASED APPLICATIONS 9

TOTAL: 45 PERIODS

OUTCOMES:
Upon successful completion of this course, students will be able to:
- Build applications based on XML.
- Develop web services using technology elements.
- Build SOA-based applications for intra-enterprise and inter-enterprise applications.

TEXTBOOKS:

REFERENCES:

IT6811 PROJECT WORK L T P C 0 0 12 6

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.

IT6001 ADVANCED DATABASE TECHNOLOGY

OBJECTIVES:
The student should be made to:
- Be familiar with a commercial relational database system (Oracle) by writing SQL using the system.
- Be familiar with the relational database theory, and be able to write relational algebra expressions for queries.

UNIT I PARALLEL AND DISTRIBUTED DATABASES

UNIT II OBJECT AND OBJECT RELATIONAL DATABASES

UNIT III XML DATABASES

UNIT IV MOBILE DATABASES

UNIT V INTELLIGENT DATABASES

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the student should be able to:
- Apply query evaluation techniques and query optimization techniques.
- Develop transaction processing systems with concurrency control.
- Design and develop a database application system as part of a team.
REFERENCES:

CS6001 C# AND .NET PROGRAMMING L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- Understand the foundations of CLR execution
- Learn the technologies of the .NET framework
- Know the object oriented aspects of C#
- Be aware of application development in .NET
- Learn web based applications on .NET(ASP.NET)

UNIT I INTRODUCTION TO C#
9
Introducing C#, Understanding .NET, overview of C#, Literals, Variables, Data Types, Operators, checked and unchecked operators, Expressions, Branching, Looping, Methods, implicit and explicit casting, Constant, Arrays, Array Class, Array List, String, String Builder, Structure, Enumerations, boxing and unboxing.

UNIT II OBJECT ORIENTED ASPECTS OF C#
9
Class, Objects, Constructors and its types, inheritance, properties, indexers, index overloading, polymorphism, sealed class and methods, interface, abstract class, abstract and interface, operator overloading, delegates, events, errors and exception, Threading.

UNIT III APPLICATION DEVELOPMENT ON .NET
9
Building windows application, Creating our own window forms with events and controls, menu creation, inheriting window forms, SDI and MDI application, Dialog Box(Modal and Modeless), accessing data with ADO.NET, DataSet, typed dataset, Data Adapter, updating database using stored procedures, SQL Server with ADO.NET, handling exceptions, validating controls, windows application configuration.

UNIT IV WEB BASED APPLICATION DEVELOPMENT ON .NET
9
Programming web application with web forms, ASP.NET introduction, working with XML and .NET, Creating Virtual Directory and Web Application, session management techniques, web.config, web services, passing datasets, returning datasets from web services, handling transaction, handling exceptions, returning exceptions from SQL Server.

UNIT V CLR AND .NET FRAMEWORK
9
Assemblies, Versioning, Attributes, reflection, viewing meta data, type discovery, reflection on type, marshalling, remoting, security in .NET

TOTAL: 45 PERIODS
OUTCOMES:
After completing this course, the student will be able to:
- List the major elements of the .NET framework.
- Explain how C# fits into the .NET platform.
- Analyze the basic structure of a C# application.
- Debug, compile, and run a simple application.
- Develop programs using C# on .NET.
- Design and develop Web-based applications on .NET.
- Discuss CLR.

TEXT BOOKS:

REFERENCES:

IT6002 INFORMATION THEORY AND CODING TECHNIQUES

OBJECTIVES:
The student should be made to:
- Understand error-control coding.
- Understand encoding and decoding of digital data streams.
- Be familiar with the methods for the generation of these codes and their decoding techniques.
- Be aware of compression and decompression techniques.
- Learn the concepts of multimedia communication.

UNIT I INFORMATION ENTROPY FUNDAMENTALS

UNIT II DATA AND VOICE CODING

UNIT III ERROR CONTROL CODING

UNIT IV COMPRESSION TECHNIQUES
UNIT V AUDIO AND VIDEO CODING


OUTCOMES:
Upon completion of the course, the student should be able to:

- Design an application with error control.
- Use compression and decompression techniques.
- Apply the concepts of multimedia communication

TEXT BOOKS:

REFERENCES:

GE6757 TOTAL QUALITY MANAGEMENT

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

UNIT I INTRODUCTION

UNIT II TQM PRINCIPLES
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
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
UNIT V  QUALITY SYSTEMS

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

TEXTBOOK:

REFERENCES:

CS6012  SOFT COMPUTING  L T P C
OBJECTIVES:
The student should be made to:
• Learn the various soft computing frame works.
• Be familiar with design of various neural networks.
• Be exposed to fuzzy logic.
• Learn genetic programming.
• Be exposed to hybrid systems.

UNIT I  INTRODUCTION

UNIT II  NEURAL NETWORKS
UNIT III  FUZZY LOGIC  9
Membership functions: features, fuzzification, methods of membership value assignments-
Defuzzification: lambda cuts - methods - fuzzy arithmetic and fuzzy measures: fuzzy arithmetic -
extension principle - fuzzy measures - measures of fuzziness -fuzzy integrals - fuzzy rule base and
approximate reasoning : truth values and tables, fuzzy propositions, formation of rules-decomposition
of rules, aggregation of fuzzy rules, fuzzy reasoning-fuzzy inference systems-overview of fuzzy expert
system-fuzzy decision making.

UNIT IV  GENETIC ALGORITHM  9
Genetic algorithm and search space - general genetic algorithm – operators - Generational cycle -
stopping condition – constraints - classification - genetic programming – multilevel optimization – real
life problem- advances in GA.

UNIT V  HYBRID SOFT COMPUTING TECHNIQUES & APPLICATIONS  9
Neuro-fuzzy hybrid systems - genetic neuro hybrid systems - genetic fuzzy hybrid and fuzzy genetic
hybrid systems - simplified fuzzy ARTMAP - Applications: A fusion approach of multispectral images
with SAR, optimization of traveling salesman problem using genetic algorithm approach, soft
computing based hybrid fuzzy controllers.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the student should be able to:
• Apply various soft computing frame works.
• Design of various neural networks.
• Use fuzzy logic.
• Apply genetic programming.
• Discuss hybrid soft computing.

TEXT BOOKS:
   Education 2004.

REFERENCES:
2. George J. Klir, Ute St. Clair, Bo Yuan, “Fuzzy Set Theory: Foundations and Applications”
   Education India, 2013.
4. James A. Freeman, David M. Skapura, “Neural Networks Algorithms, Applications, and
OBJECTIVES:
The student should be made to:
- Understand error–control coding.
- Understand encoding and decoding of digital data streams.
- Be familiar with the methods for the generation of these codes and their decoding techniques.
- Be aware of compression and decompression techniques.
- Learn the concepts of multimedia communication.

UNIT I  MULTIMEDIA COMPONENTS  
Introduction - Multimedia skills - Multimedia components and their characteristics - Text, sound, images, graphics, animation, video, hardware.

UNIT II  AUDIO AND VIDEO COMPRESSION  

UNIT III  TEXT AND IMAGE COMPRESSION  

UNIT IV  VOIP TECHNOLOGY  
Basics of IP transport, VoIP challenges, H.323/ SIP –Network Architecture, Protocols, Call establishment and release, VoIP and SS7, Quality of Service- CODEC Methods- VOIP applicability.

UNIT V  MULTIMEDIA NETWORKING  
Multimedia networking -Applications-streamed stored and audio-making the best Effort service-protocols for real time interactive Applications-distributing multimedia-beyond best effort service-secluding and policing Mechanisms-integrated services-differentiated Services-RSVP.

OUTCOMES:
Upon Completion of the course, the students will be able to
- Design an application with error–control.
- Use compression and decompression techniques.
- Apply the concepts of multimedia communication.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
The student should be made to:
- Expose the criteria for test cases.
- Learn the design of test cases.
- Be familiar with test management and test automation techniques.
- Be exposed to test metrics and measurements.

UNIT I  INTRODUCTION

UNIT II  TEST CASE DESIGN

UNIT III  LEVELS OF TESTING

UNIT IV  TEST AMANAGEMENT

UNIT V  TEST AUTOMATION

OUTCOMES:
At the end of the course the students will be able to
- Design test cases suitable for a software development for different domains.
- Identify suitable tests to be carried out.
- Prepare test planning based on the document.
- Document test plans and test cases designed.
- Use of automatic testing tools.
- Develop and validate a test plan.

TOTAL: 45 PERIODS
TEXT BOOKS:

REFERENCES:

IT6005 DIGITAL IMAGE PROCESSING

OBJECTIVES:
The student should be made to:
- Learn digital image fundamentals
- Be exposed to simple image processing techniques
- Be familiar with image compression and segmentation techniques
- Learn to represent image in form of features

UNIT I DIGITAL IMAGE FUNDAMENTALS

UNIT II IMAGE ENHANCEMENT

UNIT III IMAGE RESTORATION AND SEGMENTATION

UNIT IV WAVELETS AND IMAGE COMPRESSION

UNIT V IMAGE REPRESENTATION AND RECOGNITION

TOTAL: 45 PERIODS
OUTCOMES:
Upon successful completion of this course, students will be able to:
- Discuss digital image fundamentals
- Apply image enhancement and restoration techniques
- Use image compression and segmentation Techniques
- Represent features of images

TEXT BOOK:

REFERENCES:

CS6003 AD HOC AND SENSOR NETWORKS

OBJECTIVES:
The student should be made to:
- Understand the design issues in ad hoc and sensor networks.
- Learn the different types of MAC protocols.
- Be familiar with different types of adhoc routing protocols.
- Be expose to the TCP issues in adhoc networks.
- Learn the architecture and protocols of wireless sensor networks.

UNIT I INTRODUCTION

UNIT II MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS
Issues in designing a MAC Protocol- Classification of MAC Protocols- Contention based protocols- Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms – Multi channel MAC-IEEE 802.11

UNIT III ROUTING PROTOCOLS AND TRANSPORT LAYER IN AD HOC WIRELESS NETWORKS
Issues in designing a routing and Transport Layer protocol for Ad hoc networks- proactive routing, reactive routing (on-demand), hybrid routing- Classification of Transport Layer solutions-TCP over Ad hoc wireless Networks.
UNIT IV  WIRELESS SENSOR NETWORKS (WSNS) AND MAC PROTOCOLS  9
single node architecture: hardware and software components of a sensor node - WSN Network architecture: typical network architectures-data relaying and aggregation strategies -MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC- IEEE 802.15.4.

UNIT V  WSN ROUTING, LOCALIZATION & QOS  9

OUTCOMES:
Upon completion of the course, the student should be able to:
• Explain the concepts, network architectures and applications of ad hoc and wireless sensor networks.
• Analyze the protocol design issues of ad hoc and sensor networks.
• Design routing protocols for ad hoc and wireless sensor networks with respect to some protocol design issues.
• Evaluate the QoS related performance measurements of ad hoc and sensor networks.

TEXT BOOK:

REFERENCES:

IT6006  DATA ANALYTICS  L T P C  3 0 0 3

OBJECTIVES:
The Student should be made to:
• Be exposed to big data
• Learn the different ways of Data Analysis
• Be familiar with data streams
• Learn the mining and clustering
• Be familiar with the visualization

UNIT I  INTRODUCTION TO BIG DATA  8
UNIT II DATA ANALYSIS 12

UNIT III MINING DATA STREAMS 8

UNIT IV FREQUENT ITEMSETS AND CLUSTERING 9

UNIT V FRAMEWORKS AND VISUALIZATION 8
MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed file systems – Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications:

OUTCOMES:
The student should be made to:

• Apply the statistical analysis methods.
• Compare and contrast various soft computing frameworks.
• Design distributed file systems.
• Apply Stream data model.
• Use Visualisation techniques

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
The student should be made to:
- Be exposed to the context and operation of free and open source software (FOSS) communities and associated software projects.
- Be familiar with participating in a FOSS project
- Learn scripting language like Python or Perl
- Learn programming language like Ruby
- Learn some important FOSS tools and techniques

UNIT I  PHILOSOPHY

UNIT II  LINUX

UNIT III  PROGRAMMING LANGUAGES
Programming using languages like Python or Perl or Ruby

UNIT IV  PROGRAMMING TOOLS AND TECHNIQUES
Usage of design Tools like Argo UML or equivalent, Version Control Systems like Git or equivalent, – Bug Tracking Systems- Package Management Systems

UNIT V  FOSS CASE STUDIES
Open Source Software Development - Case Study – Libreoffice -Samba

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the student should be able to:
- Install and run open-source operating systems.
- Gather information about Free and Open Source Software projects from software releases and from sites on the internet.
- Build and modify one or more Free and Open Source Software packages.
- Use a version control system.
- Contribute software to and interact with Free and Open Source Software development projects.

TEXT BOOK:

REFERENCES:
OBJECTIVES:
The student should be made to:
- Learn the basics of socket programming using TCP Sockets.
- Learn about Socket Options.
- Learn to develop Macros for including Objects In MIB Structure.
- Understand SNMPv1, v2 and v3 protocols & practical issues.

UNIT I  SOCKETS AND APPLICATION DEVELOPMENT 9
Introduction to Socket Programming - System Calls - Address conversion functions - POSIX Signal Handling - Server with multiple clients - Boundary conditions - Server process Crashes, Server host Crashes, Server Crashes and reboots, Server Shutdown - I/O Multiplexing - I/O Models -TCP echo client/server with I/O Multiplexing

UNIT II  SOCKET OPTIONS 9
Socket options - getsockopt and setsockopt functions - Generic socket options - IP socket options - ICMP socket options - TCP socket options - Multiplexing TCP and UDP sockets - SCTP Sockets - SCTP Client/server - Streaming Example - Domain name system - gethostbyname, gethostbyaddr, getservbyname and getservbyport functions - Protocol Independent functions in TCP Client/Server Scenario

UNIT III  ADVANCED SOCKETS 9
IPv4 and IPv6 interoperability - Threaded servers - Thread creation and termination - TCP echo server using threads - Mutex - Condition variables - Raw sockets - Raw socket creation - Raw socket output - Raw socket input - ping program - traceroute program

UNIT IV  SIMPLE NETWORK MANAGEMENT 9

UNIT V  SNMP V2, V3 AND RMO 9
Introduction to SNMPv2 - SMI for SNMPV2 - Protocol - SNMPv3 - Architecture and applications - Security and access control model - Overview of RMON.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the student should be able to:
Develop programs using TCP Sockets.
- Use Socket Options.
- Develop Macros for including Objects In MIB Structure.
- Use SNMPv1, v2 and v3 protocols.

TEXT BOOKS:

REFERENCE:
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 – Kohlberg’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
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics –
A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9
Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk -
Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational

UNIT V GLOBAL ISSUES 8
Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors –
Moral Leadership –Code of Conduct – Corporate Social Responsibility

TOTAL: 45 PERIODS

OUTCOMES:
- 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:
   Delhi, 2004.

REFERENCES:
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics – Concepts and
   Cases”, Cengage Learning, 2009
5. Laura P. Hartman and Joe Desjardins, “Business Ethics: Decision Making for Personal Integrity
OBJECTIVES:
The student should be made to:
- Understand various Computing models like Finite State Machine, Pushdown Automata, and Turing Machine.
- Be aware of Decidability and Undecidability of various problems.
- Learn types of grammars

UNIT I  FINITE AUTOMATA

UNIT II  GRAMMARS

UNIT III  PUSHDOWN AUTOMATA

UNIT IV  TURING MACHINES
Definitions of Turing machines – Models – Computable languages and functions –Techniques for Turing machine construction – Multi head and Multi tape Turing Machines - The Halting problem – Partial Solvability – Problems about Turing machine- Chomskian hierarchy of languages.

UNIT V  UNSOLVABLE PROBLEMS AND COMPUTABLE FUNCTIONS
Unsolvable Problems and Computable Functions – Primitive recursive functions – Recursive and recursively enumerable languages – Universal Turing machine. MEASURING AND CLASSIFYING COMPLEXITY: Tractable and Intractable problems- Tractable and possibly intractable problems - P and NP completeness - Polynomial time reductions.

OUTCOMES:
At the end of the course, the student should be able to:
- Design Finite State Machine, Pushdown Automata, and Turing Machine.
- Explain the Decidability or Undecidability of various problems
TEXT BOOKS:

REFERENCES:

IT6009 WEB ENGINEERING

OBJECTIVES:
The student should be made to:
- Understand the characteristics of web applications
- Learn to Model web applications
- Be aware of Systematic methods
- Be familiar with the testing techniques for web applications

UNIT I INTRODUCTION TO WEB ENGINEERING AND REQUIREMENTS

UNIT II WEB APPLICATION ARCHITECTURES & MODELLING WEB APPLICATIONS

UNIT III WEB APPLICATION DESIGN
UNIT IV  TESTING WEB APPLICATIONS  8

UNIT V  WEB PROJECT MANAGEMENT  8
Understanding Scope, Refining Framework Activities, Building a Web Team, Managing Risk, Developing a Schedule, Managing Quality, Managing Change, Tracking the Project. Introduction to node JS - web sockets.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the student should be able to:
- Apply the characteristics of web applications.
- Model web applications.
- Design web applications.
- Test web applications.

TEXT BOOKS:

REFERENCES:

BM6005  BIO INFORMATICS  L T P C  3 0 0 3

OBJECTIVES:
The student should be made to:
- Exposed to the need for Bioinformatics technologies.
- Be familiar with the modeling techniques.
- Learn microarray analysis.
- Exposed to Pattern Matching and Visualization.

UNIT I  INTRODUCTION  9
Need for Bioinformatics technologies – Overview of Bioinformatics technologies Structural bioinformatics – Data format and processing – Secondary resources and applications – Role of Structural bioinformatics - Biological Data Integration System.
UNIT II  DATAWAREHOUSING AND DATAMINING IN BIOINFORMATICS  
Bioinformatics data – Data warehousing architecture – data quality – Biomedical data analysis – DNA data analysis – Protein data analysis – Machine learning – Neural network architecture and applications in bioinformatics.

UNIT III  MODELING FOR BIOINFORMATICS  

UNIT IV  PATTERN MATCHING AND VISUALIZATION  

UNIT V  MICROARRAY ANALYSIS  

OUTCOMES:
Upon Completion of the course, the students will be able to
1. Develop models for biological data
2. Apply pattern matching techniques to bioinformatics data – protein data genomic data.
3. Apply micro array technology for genomic expression study

TEXT BOOK:

REFERENCES:

CS6004  CYBER FORENSICS  
OBJECTIVES:
The student should be made to:
1. Learn the security issues network layer and transport layer.
2. Be exposed to security issues of the application layer.
3. Learn computer forensics.
4. Be familiar with forensics tools.
5. Learn to analyze and validate forensics data.

UNIT I  NETWORK LAYER SECURITY & TRANSPORT LAYER SECURITY  
UNIT II E-MAIL SECURITY & FIREWALLS
PGP - S/MIME - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs - SET for E-Commerce Transactions.

UNIT III INTRODUCTION TO COMPUTER FORENSICS

UNIT IV EVIDENCE COLLECTION AND FORENSICS TOOLS

UNIT V ANALYSIS AND VALIDATION

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the student should be able to:
- Discuss the security issues network layer and transport layer.
- Apply security principles in the application layer.
- Explain computer forensics.
- Use forensics tools.
- Analyze and validate forensics data.

TEXT BOOKS:

REFERENCES:

CS6702 GRAPH THEORY AND APPLICATIONS
OBJECTIVES:
The student should be made to:
- Be familiar with the most fundamental Graph Theory topics and results.
- Be exposed to the techniques of proofs and analysis.

UNIT I INTRODUCTION
UNIT II  TREES, CONNECTIVITY & PLANARITY  9

UNIT III  MATRICES, COLOURING AND DIRECTED GRAPH  8

UNIT IV  PERMUTATIONS & COMBINATIONS  9
Fundamental principles of counting - Permutations and combinations - Binomial theorem - combinations with repetition - Combinatorial numbers - Principle of inclusion and exclusion - Derangements - Arrangements with forbidden positions.

UNIT V  GENERATING FUNCTIONS  10
Generating functions - Partitions of integers - Exponential generating function – Summation operator - Recurrence relations - First order and second order – Non-homogeneous recurrence relations - Method of generating functions.

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students should be able to:
- Write precise and accurate mathematical definitions of objects in graph theory.
- Use mathematical definitions to identify and construct examples and to distinguish examples from non-examples.
- Validate and critically assess a mathematical proof.
- Use a combination of theoretical knowledge and independent mathematical thinking in creative investigation of questions in graph theory.
- Reason from definitions to construct mathematical proofs.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
The student should be made to:
- Understand the concept of semantic web and related applications.
- Learn knowledge representation using ontology.
- Understand human behaviour in social web and related communities
- Learn visualization of social networks.

UNIT I INTRODUCTION

UNIT II MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION

UNIT III EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS

UNIT IV PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES

UNIT V VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the student should be able to:
- Develop semantic web related applications.
- Represent knowledge using ontology.
- Predict human behaviour in social web and related communities.
- Visualize social networks.
TEXT BOOKS:

REFERENCES:

IT6010 BUSINESS INTELLIGENCE L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
• Be exposed with the basic rudiments of business intelligence system
• understand the modeling aspects behind Business Intelligence
• understand of the business intelligence life cycle and the techniques used in it
• Be exposed with different data analysis tools and techniques

UNIT I BUSINESS INTELLIGENCE 9

UNIT II KNOWLEDGE DELIVERY 9
The business intelligence user types, Standard reports, Interactive Analysis and Ad Hoc Querying, Parameterized Reports and Self-Service Reporting, dimensional analysis, Alerts/Notifications, Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards, Geographic Visualization, Integrated Analytics, Considerations: Optimizing the Presentation for the Right Message.

UNIT III EFFICIENCY 9
Efficiency measures – The CCR model: Definition of target objectives- Peer groups – Identification of good operating practices; cross efficiency analysis – virtual inputs and outputs – Other models. Pattern matching – cluster analysis, outlier analysis

UNIT IV BUSINESS INTELLIGENCE APPLICATIONS 9
Marketing models – Logistic and Production models – Case studies.

UNIT V FUTURE OF BUSINESS INTELLIGENCE 9

TOTAL: 45 PERIODS
OUTCOMES:
At the end of the course the students will be able to
- Explain the fundamentals of business intelligence.
- Link data mining with business intelligence.
- Apply various modeling techniques.
- Explain the data analysis and knowledge delivery stages.
- Apply business intelligence methods to various situations.
- Decide on appropriate technique.

TEXT BOOK:

REFERENCES:

IT6011 KNOWLEDGE MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- Learn the Evolution of Knowledge management.
- Be familiar with tools.
- Be exposed to Applications.
- Be familiar with some case studies.

UNIT I INTRODUCTION
Introduction: An Introduction to Knowledge Management - The foundations of knowledge management- including cultural issues- technology applications organizational concepts and processes- management aspects- and decision support systems. The Evolution of Knowledge management: From Information Management to Knowledge Management - Key Challenges Facing the Evolution of Knowledge Management - Ethics for Knowledge Management.

UNIT II CREATING THE CULTURE OF LEARNING AND KNOWLEDGE SHARING
UNIT III KNOWLEDGE MANAGEMENT-THE TOOLS 10
Telecommunications and Networks in Knowledge Management - Internet Search Engines and Knowledge Management - Information Technology in Support of Knowledge Management - Knowledge Management and Vocabulary Control - Information Mapping in Information Retrieval - Information Coding in the Internet Environment - Repackaging Information.

UNIT IV KNOWLEDGEMANAGEMENT-APPLICATION 9
Components of a Knowledge Strategy - Case Studies (From Library to Knowledge Center, Knowledge Management in the Health Sciences, Knowledge Management in Developing Countries).

UNIT V FUTURE TRENDS AND CASE STUDIES 9
Advanced topics and case studies in knowledge management - Development of a knowledge management map/plan that is integrated with an organization's strategic and business plan - A case study on Corporate Memories for supporting various aspects in the process life-cycles of an organization.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the student should be able to:
- Use the knowledge management tools.
- Develop knowledge management Applications.
- Design and develop enterprise applications.

TEXT BOOK:

REFERENCE:

IT6012 TCP/IP DESIGN AND IMPLEMENTATION

OBJECTIVES:
The student should be made to:
- Understand the IP addressing schemes.
- Understand the fundamentals of network design and implementation.
- Understand the design and implementation of TCP/IP networks.
- Understand on network management issues.
- Learn to design and implement network applications.

UNIT I INTRODUCTION 9
UNIT II    TCP


UNIT III   IP IMPLEMENTATION

IP global software organization – routing table – routing algorithms – fragmentation and reassembly – error processing (ICMP) – Multicast Processing (IGMP).

UNIT IV    TCP IMPLEMENTATION I

Data structure and input processing – transmission control blocks – segment format – comparison – finite state machine implementation – Output processing – mutual exclusion – computing the TCP Data length.

UNIT V     TCP IMPLEMENTATION II


TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the student should be able to:

- Design and implement TCP/IP networks.
- Explain network management issues.
- Design and implement network applications.
- Develop data structures for basic protocol functions of TCP/IP.
- Apply the members in the respective structures.
- Design and implement data structures for maintaining multiple local and global timers.

TEXT BOOKS


REFERENCES


CS6008    HUMAN COMPUTER INTERACTION

OBJECTIVES:

The student should be made to:

- Learn the foundations of Human Computer Interaction
- Be familiar with the design technologies for individuals and persons with disabilities
- Be aware of mobile HCI
- Learn the guidelines for user interface.
UNIT I  FOUNDATIONS OF HCI

UNIT II  DESIGN & SOFTWARE PROCESS

UNIT III  MODELS AND THEORIES
Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.

UNIT IV  MOBILE HCI

UNIT V  WEB INTERFACE DESIGN

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the student should be able to:
- Design effective dialog for HCI.
- Design effective HCI for individuals and persons with disabilities.
- Assess the importance of user feedback.
- Explain the HCI implications for designing multimedia/ecommerce/e-learning Web sites.
- Develop meaningful user interface.

TEXT BOOKS:

IT6013  SOFTWARE QUALITY ASSURANCE  L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- Understand the basic tenets of software quality and quality factors.
- Be exposed to the Software Quality Assurance (SQA) architecture and the details of SQA components.
- Understand of how the SQA components can be integrated into the project life cycle.
- Be familiar with the software quality infrastructure.
- Be exposed to the management components of software quality.
UNIT I INTRODUCTION TO SOFTWARE QUALITY & ARCHITECTURE

UNIT II SQA COMPONENTS AND PROJECT LIFE CYCLE

UNIT III SOFTWARE QUALITY INFRASTRUCTURE
Procedures and work instructions - Templates - Checklists – 3S developmenting - Staff training and certification Corrective and preventive actions – Configuration management – Software change control – Configuration management audit -Documentation control – Storage and retrieval.

UNIT IV SOFTWARE QUALITY MANAGEMENT & METRICS

UNIT V STANDARDS, CERTIFICATIONS & ASSESSMENTS

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course the students will be able to:
- Utilize the concepts in software development life cycle.
- Demonstrate their capability to adopt quality standards.
- Assess the quality of software product.
- Apply the concepts in preparing the quality plan & documents.

TEXT BOOK:

REFERENCES:
OBJECTIVES:
- To outline the need for Software Project Management
- To highlight different techniques for software cost estimation and activity planning.

UNIT I  PROJECT EVALUATION AND PROJECT PLANNING

UNIT II  PROJECT LIFE CYCLE AND EFFORT ESTIMATION

UNIT III  ACTIVITY PLANNING AND RISK MANAGEMENT

UNIT IV  PROJECT MANAGEMENT AND CONTROL

UNIT V  STAFFING IN SOFTWARE PROJECTS

OUTCOMES:
- At the end of the course the students will be able to practice Project Management principles while developing a software.

TEXTBOOK:

REFERENCES:
## 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 4th Semester Summer Vacation*

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### SEMESTER VIII

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### LIST OF ELECTIVES

#### ELECTIVE I

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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
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
- Project
- Assignment
- Reviews
- Creative writing
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


UNIT II SEQUENCES AND SERIES


UNIT III APPLICATIONS OF DIFFERENTIAL CALCULUS

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


UNIT V MULTIPLE INTEGRALS


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.

TEXT BOOKS:

REFERENCES:

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
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

UNIT III QUANTUM PHYSICS

UNIT IV ACOUSTICS AND ULTRASONICS
Production of ultrasonics 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 PHOTOGRAPHICS AND FIBRE OPTICS

TOTAL: 45 PERIODS

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.

TEXT BOOKS:
1. Arumugam M. Engineering Physics. Anuradha publishers, 2010

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

CY6151 ENGINEERING CHEMISTRY - I

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 polydispersity 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  NANOCHEMISTRY  
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

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.

TEXT BOOKS:

REFERENCES:

GE6151  COMPUTER PROGRAMMING  
L T P C  3 0 0 3

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:

GE6152 ENGINEERING GRAPHICS
L T P C
2 0 3 4

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  5+9
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  5+9
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  5+9
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  5+9
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  6+9
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)  3
Introduction to drafting packages and demonstration of their use.

TOTAL : 75 PERIODS

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.

TEXT BOOK:

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.

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**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:**
1. Search, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions – Includes Parameter Passing
9. Program using Recursive Function and conversion from given program to flow chart.
10. 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.
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  
6. Hearth furnace, anvil and smithy tools  
7. Moulding table, foundry tools  
8. Power Tool: Angle Grinder  
9. Study-purpose items: centrifugal pump, air-conditioner

Electrical
1. Assorted electrical components for house wiring  
2. Electrical measuring instruments  
3. Study purpose items: Iron box, fan and regulator, emergency lamp  
4. Megger (250V/500V)  
5. Power Tools: (a) Range Finder  
   (b) Digital Live-wire detector

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

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.

TOTAL: 30 PERIODS

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, porcelain tile, dropper (each 30 Nos.)

HS6251 TECHNICAL ENGLISH II L T P C 3 1 0 4

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.
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 9+3
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.

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

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%

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 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 parallelepipeds.

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 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, z², 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).
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.

TEXT BOOKS:

REFERENCES:

PH6251 ENGINEERING PHYSICS – II L T P C 3 0 0 3

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
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


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.

TEXT BOOKS:

REFERENCES:

CY6251 ENGINEERING CHEMISTRY - II

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
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 – refactoriness 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.

TEXT BOOKS:

REFERENCES:
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:

GE6253  ENGINEERING MECHANICS  L T P C
3 1 0 4

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
Free body diagram – Types of supports – Action and reaction forces – stable equilibrium –
Moments and Couples – Moment of a force about a point and about an axis – Vectorial
representation of moments and couples – Scalar components of a moment – Varignon’s theorem
– Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid
bodies in three dimensions

UNIT III
PROPERTIES OF SURFACES AND SOLIDS
12
Centroids and centre of mass– Centroids of lines and areas - Rectangular, circular, triangular
areas by integration – T section, I section, - Angle section, Hollow section by using standard
formula –Theorems of Pappus - Area moments of inertia of plane areas – Rectangular, circular,
triangular areas by integration – T section, I section, Angle section, Hollow section by using
standard formula – Parallel axis theorem and perpendicular axis theorem –Principal moments of
inertia of plane areas – Principal axes of inertia-Mass moment of inertia–mass moment of inertia
for prismatic, cylindrical and spherical solids from first principle – Relation to area moments of
inertia.

UNIT IV
DYNAMICS OF PARTICLES
12
Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion
bodies.

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.

TOTAL : 60 PERIODS

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.

TEXT BOOKS:

REFERENCES:
  company, New Delhi 2008.

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>

GE6262 PHYSICS AND CHEMISTRY LABORATORY – II

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, porcelain 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
Dirichlet’s conditions -- General Fourier series -- Odd and even functions -- Half range sine series -- Half range cosine series -- Complex form of Fourier series -- Parseval’s identity -- Harmonic analysis.

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
Statement of Fourier integral theorem -- Fourier transform pair -- Fourier sine and cosine transforms -- Properties -- Transforms of simple functions -- Convolution theorem -- Parseval’s identity.

UNIT V Z-TRANSFORMS AND DIFFERENCE EQUATIONS  9+3

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

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 L T P C 3 0 0 3

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 12
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 10
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

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

TEXT BOOKS :
REFERENCES:

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.

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:
1. Varghese, P.C., Engineering Geology for Civil Engineering Prentice Hall of India Learning
   Private Limited, New Delhi, 2012.
   2011.
   house, Ludhiana 2009.

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
Stress and strain at a point – Tension, Compression, Shear Stress – Hooke’s Law – Relationship
among elastic constants – Stress Strain Diagram for Mild Steel, TOR steel, Concrete – Ultimate
Stress – Yield Stress – Factor of Safety – Thermal Stresses – Thin Cylinders and Shells – Strain
Energy due to Axial Force – Resilience – Stresses due to impact and Suddenly Applied Load –
Compound Bars.

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
Double integration method - Macaulay's methods - Area moment method - conjugate beam
method for computation of slopes and deflections of determinant beams.

UNIT IV TORSION
Torsion of Circular and Hollow Shafts – Elastic Theory of Torsion – Stresses and Deflection in
Circular Solid and Hollow Shafts – combined bending moment and torsion of shafts - strain energy
due to torsion - Modulus of Rupture – Power transmitted to shaft – Shaft in series and parallel –
Closed and Open Coiled helical springs – Leaf Springs – Springs in series and parallel – Design of
buffer springs.
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.

TEXT BOOKS:

REFERENCES:

CE6303
MECHANICS OF FLUIDS

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 – bounciness and floatation.

UNIT II
FLUID KINEMATICS AND DYNAMICS


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. 

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  
UNIT IV  LEVELLING APPLICATIONS  9

UNIT V  THEODOLITE SURVEYING  9
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
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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</tr>
</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>
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<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></td>
</tr>
<tr>
<td>7.</td>
<td>Leveling staff</td>
<td></td>
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<tr>
<td>8.</td>
<td>Cross staff</td>
<td></td>
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<tr>
<td>9.</td>
<td>Chains</td>
<td>1 for a set of 5 students</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 L T P C 0 0 4 2

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.

TEXT BOOKS:

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

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<tr>
<th>Sl. No.</th>
<th>Description of Equipment</th>
<th>Quantity</th>
</tr>
</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

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 formulæ.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9+3

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9+3

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

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

TEXT BOOKS:

REFERENCES:

CE6401 CONSTRUCTION MATERIALS

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

UNIT I STONES – BRICKS – CONCRETE BLOCKS

UNIT II LIME – CEMENT – AGGREGATES – MORTAR

UNIT III CONCRETE

UNIT IV TIMBER AND OTHER MATERIALS

UNIT V MODERN MATERIALS

TOTAL: 45 PERIODS
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 LT P C 3 1 0 4

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 9
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 9
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 9
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  
L T P C  
3 1 0 4

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  
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  
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).

TEXT BOOKS:

REFERENCES:
4. Mays L. W., "Water Resources Engineering", John Wiley and Sons (WSE), New York, 2005
UNIT V ADVANCED TOPICS IN SURVEYING


TOTAL: 45 PERIODS

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

TEXT BOOKS:

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 COMPACTION

UNIT II SOIL WATER AND WATER FLOW

UNIT III STRESS DISTRIBUTION AND SETTLEMENT
UNIT IV       SHEAR STRENGTH

UNIT V       SLOPE STABILITY

TOTAL: 45 PERIODS

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.

TEXT BOOKS:

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

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description of Equipment</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>UTM of minimum 400 kN capacity</td>
<td>1</td>
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<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 (any 2)</td>
<td>1 each</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

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

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)

TOTAL: 45 PERIODS

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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<tr>
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<th>Quantity</th>
</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</td>
<td>1 Unit</td>
</tr>
<tr>
<td></td>
<td>(i) Channel with provision for fixing notches (rectangular, triangular &amp; trapezoidal forms)</td>
<td></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</td>
<td>1 Unit</td>
</tr>
<tr>
<td></td>
<td>(i) Venturimeter,U tube manometer fixtures like Valves, collecting tank</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(ii) Orifice meter, with all necessary fittings in pipe lines of different diameters</td>
<td></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 pieceTank 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</td>
<td>1 Unit</td>
</tr>
<tr>
<td></td>
<td>Pipe lengths (min. 3m) of different diameters with Valves and pressure rapping &amp; collecting tank</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Minor Losses</td>
<td>1 Unit</td>
</tr>
<tr>
<td></td>
<td>Pipe line assembly with provisions for having Sudden contractions in diameter, expansions Bends, elbow fitting, etc.</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Pumps</td>
<td>1 Unit</td>
</tr>
<tr>
<td></td>
<td>(i) Centrifugal pump assembly with accessories (single stage)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(ii) Centrifugal pump assembly with accessories (multi stage)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(iii) Reciprocating pump assembly with accessories</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(iv) Deep well pump assembly set with accessories</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Turbine</td>
<td>1 Unit</td>
</tr>
<tr>
<td></td>
<td>(i) Impulse turbine assembly with fittings &amp; accessories</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(ii) Francis turbine assembly with fittings &amp; accessories</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(iii) Kaplan turbine assembly with fittings &amp; accessories</td>
<td></td>
</tr>
</tbody>
</table>
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.

TOTAL: 60 PERIODS

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:

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<td>Dumpy level</td>
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<td>4.</td>
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<td>5.</td>
<td>Pocket stereoscope</td>
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<td>6.</td>
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</tr>
<tr>
<td>7.</td>
<td>Levelling staff</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Cross staff</td>
<td>1 for a set of 5 students</td>
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<tr>
<td>9.</td>
<td>Chains</td>
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<tr>
<td>10.</td>
<td>Tapes</td>
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<tr>
<td>11.</td>
<td>Arrows</td>
<td></td>
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<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 deformer

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
• analysis trusses, frames and arches
• analyse structures for moving loads and
• will be conversant with classical methods of analysis.

TEXT BOOKS:
   Publications Pvt. Ltd., New Delhi, 2004
   2013.
   Delhi, 2008

REFERENCES:
   New Delhi, 2010
   Ltd., New Delhi, 2011.
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

UNIT II SHALLOW FOUNDATION

UNIT III FOOTINGS AND RAFTS
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
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 in situ 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

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.

TEXT BOOKS:
REFERENCES:

CE6503 ENVIRONMENTAL ENGINEERING I

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


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

TEXT BOOKS:

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.

TEXT BOOKS:
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

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.

TEXT BOOKS:

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

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.

**TEXT BOOKS:**


**REFERENCES:**


**GE6563  COMMUNICATION SKILLS – LABORATORY BASED**

**OBJECTIVES:**

- To provide opportunities to learners to practice their communicative skills to make them become proficient users of English.
To enable learners to fine-tune their linguistic skills (LSRW) with the help of technology to communicate globally.
To enhance the performance of learners at placement interviews and group discussions and other recruitment procedures.

UNIT I LISTENING/VIEWING
Listening and note-taking – Listening to telephonic conversations – Ted talks – Inspiring Speeches – Watching documentaries on personalities, places, socio-cultural events, TV news programmes and discussions to answer different kinds questions, viz., identifying key idea and comprehension questions… so on.

UNIT II SPEAKING

UNIT III READING
Different genres of text (literature, media, technical) for comprehension – Reading strategies like note-making – reading graphs, charts and graphic organizer – Sequencing sentences – reading online sources like e-books, e-journals and e-newspapers.

UNIT IV WRITING

UNIT V VOCABULARY
Idioms and Phrases – Proverbs – Collocations – Chunks of language.

UNIT VI GRAMMAR
Sentence structures – Subject-Verb agreement – Pronoun-Antecedent agreement – Tense forms – Active and passive voices – Direct and Indirect speeches – Cohesive devices.

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>Sl. No.</th>
<th>Description of Equipment (Minimum configuration)</th>
<th>Qty Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Server&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>Client Systems&lt;br&gt;• PIII System&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>No.</td>
<td>Item</td>
<td>Quantity</td>
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<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>
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<tr>
<td>7</td>
<td>Audio Mixer</td>
<td>1 No.</td>
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<tr>
<td>8</td>
<td>DVD recorder/player</td>
<td>1 No.</td>
</tr>
<tr>
<td>9</td>
<td>LCD Projector with MP3/CD/DVD provision for Audio/video facility</td>
<td>1 No.</td>
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</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
- Online Test - 35 marks
- Interview - 15 marks
- Presentation - 15 marks
- Group Discussion - 15 marks

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, case studies and abstract concept

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:

CE6511 SOIL MECHANICS LABORATORY           L T P C
                                          0 0 4 2

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**
   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 IN SITU DENSITY AND COMPACTION CHARACTERISTICS**
   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

**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>Shrinkage 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>
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</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>
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  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  9
Design of Cantilever and Counterfort Retaining walls

UNIT II  WATER TANKS  9
Design of rectangular and circular water tanks both below and above ground level - Design of circular slab.

UNIT III  SELECTED TOPICS  9
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  9
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  9
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.

TEXT BOOKS:

REFERENCES:

CE6602 STRUCTURAL ANALYSIS II L T P C 3 1 0 4

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 9
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 9
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 9

UNIT IV PLASTIC ANALYSIS OF STRUCTURES 9

UNIT V SPACE AND CABLE STRUCTURES 9
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.

TEXT BOOKS:

REFERENCES:
CE6603 DESIGN OF STEEL STRUCTURES

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.

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

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.

TEXT BOOKS:
REFERENCES:
5. IS800 :2007, General Construction In Steel - Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007

CE6604 RAILWAYS, AIRPORTS AND HARBOUR ENGINEERING L T P C 3 0 0 3

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

TOTAL: 45 PERIODS

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

REFERENCES:

CE6605 ENVIRONMENTAL 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

TEXT BOOKS:

REFERENCES:

CE6611 ENVIRONMENTAL ENGINEERING LABORATORY

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)

TOTAL: 45 PERIODS

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>
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<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>
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</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>
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<tbody>
<tr>
<td>1.</td>
<td>Concrete cube moulds</td>
<td>6</td>
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<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>
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<tr>
<td>4.</td>
<td>Sieves</td>
<td>1 set</td>
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<tr>
<td>5.</td>
<td>Concrete Mixer</td>
<td>1</td>
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<tr>
<td>6.</td>
<td>Slump cone</td>
<td>3</td>
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<tr>
<td>7.</td>
<td>Flow table</td>
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<tr>
<td>8.</td>
<td>Vibrator</td>
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<tr>
<td>9.</td>
<td>Trovels and planers</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>
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<tr>
<td>12.</td>
<td>Aggregate impact testing machine</td>
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<tr>
<td>13.</td>
<td>CBR Apparatus</td>
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<tr>
<td>14.</td>
<td>Blains Apparatus</td>
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<tr>
<td>15.</td>
<td>Los Angeles abrasion testing machine</td>
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<tr>
<td>16.</td>
<td>Marshall Stability Apparatus</td>
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</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 THEOREY OF VIBRATIONS**  
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**  
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**  

**UNIT IV RESPONSE OF STRUCTURES TO EARTHQUAKE**  

**UNIT V DESIGN METHODOLOGY**  

**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.
TEXT BOOKS:

REFERENCES:

CE6702 PRESTRESSED CONCRETE STRUCTURES L T P C
3 0 0 3

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 – Location of wires in pre-tensioned beams – Layout of cables in post-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.
CE6703 WATER RESOURCES AND IRRIGATION ENGINEERING

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.

TEXT BOOKS:

REFERENCES:

CE6711 COMPUTER AIDED DESIGN AND DRAFTING LABORATORY

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

OUT COMES:
- 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.

TEXT BOOKS:

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>
</tr>
</tbody>
</table>
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.

EVALUATION PROCEDURE
The method of evaluation will be as follows:
1. Internal Marks
   (Decided by conducting 3 reviews by the guide appointed by the Institution) : 20 marks
2. Evaluation of Project Report
   (Evaluated by the external examiner appointed the University). Every student belonging to the same group gets the same mark
3. Viva voce examination
   (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) : 50 marks

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

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
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

UNIT III  SPECIFICATION AND TENDERS
Data – Schedule of rates – Analysis of rates – Specifications – sources – Preparation of detailed and general specifications – Tenders – TTT Act – e-tender – Preparation of Tender Notice and
UNIT IV  VALUATION  8

UNIT V  REPORT PREPARATION  8

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.

TEXT BOOKS:

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

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  9

UNIT II  PLANNING  9

UNIT III  ORGANISING  9
UNIT IV   DIRECTING  9

UNIT V   CONTROLLING  9
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  L T P C  0 0 12 6

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.
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

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

UNIT II  ABSTRACTION FROM PRECIPITATION

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

UNIT III  HYDROGRAPHS

- Factors affecting Hydrograph
- Baseflow separation
- Unit hydrograph
- Derivation of unit hydrograph
- S curve hydrograph
- Unit hydrograph of different deviations
- Synthetic Unit Hydrograph

UNIT IV  FLOODS AND FLOOD ROUTING

- Flood frequency studies
- Recurrence interval
- Gumbel’s method
- Flood routing
- Reservoir flood routing
- Muskingum’s Channel Routing
- Flood control

UNIT V  GROUND WATER HYDROLOGY

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

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.

TEXT BOOKS:

REFERENCES:
UNIT I CONSTITUENT MATERIALS
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
Accelerators-Retarders- Plasticisers- Water proofers - Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline -Their effects on concrete properties

UNIT III PROPORTIONING OF CONCRETE MIX
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
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

TOTAL : 45 PERIODS

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.

TEXT BOOKS:
2. Shetty,M.S, "Concrete Technology" , S.Chand and Company Ltd, New Delhi, 2003

REFERENCES:
1. Santhakumar,A.R; "Concrete Technology" , Oxford University Press, New Delhi, 2007
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
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

TEXT BOOKS:  

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

CE6004   ARCHITECTURE  
L T P C  
3 0 0 3

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  
Residential, institutional, commercial and Industrial – Application of anthropometry and space standards-Inter relationships of functions – Safety standards – Building rules and regulations – Integration of building services – Interior design
UNIT IV CLIMATE AND ENVIRONMENTAL RESPONSIVE DESIGN 8
Man and environment interaction - Factors that determine climate – Characteristics of climate types – Design for various climate types – Passive and active energy controls – Green building concept

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

TOTAL: 45 PERIODS

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

UNIT II ENGINEERING ETHICS 9

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9
OUTCOMES:
- 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

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

UNIT II SCHEDULING PROCEDURES AND TECHNIQUES
Relevance of construction schedules-Bar charts - The critical path method-Calculations for critical path scheduling-Activity float and schedules-Presenting project schedules-Critical path scheduling for Activity-on-node and with leads, Lags and Windows-Calculations for scheduling with leads, lags and windows-Resource oriented scheduling-Scheduling with resource constraints and 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 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.

TEXT BOOKS:

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  10
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.

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

TEXT BOOKS:
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

CE6007 HOUSING PLANNING AND MANAGEMENT L T P C
3 0 0 3

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.

TEXT BOOKS:

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

CE6008  
GROUNDWATER ENGINEERING  
L T P C  
3 0 0 3

OBJECTIVES:
- To introduce the student to the principles of Groundwater governing Equations and Characteristics of different aquifers,
- To understand the techniques of development and management of groundwater.
UNIT I  HYDROGEOLOGICAL PARAMETERS  9

UNIT II  WELL HYDRAULICS  9

UNIT III  GROUNDWATER MANAGEMENT  9

UNIT IV  GROUNDWATER QUALITY  9
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  9
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.

TEXT BOOKS:

REFERENCES:

CE6009  WATER RESOURCES SYSTEMS ANALYSIS  L T P C 3 0 0 3

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

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

UNIT II  PHYSICAL AND SOCIO - ECONOMIC DATA  6
Collection, evaluation and processing – project appraisal – public involvement, master Comprehensive and integrated planning of water resources project.
UNIT III   LINEAR PROGRAMMING  10
Operation research - introduction - Problem Formulation-graphical solution- Simplex method – Sensitivity analysis - simple applications

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

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

TOTAL: 45 PERIODS

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.

TEXT BOOK:

REFERENCES:

CE6010   PAVEMENT ENGINEERING  LT P C 3 0 0 3

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.

80
UNIT IV PERFORMANCE EVALUATION AND MAINTENANCE

UNIT V STABILIZATION OF PAVEMENTS

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.

TEXT BOOKS:

REFERENCES:

EN6801 ENVIRONMENTAL IMPACT ASSESSMENT L T P C
3 0 0 3

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  10

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

TEXT BOOKS:

REFERENCES:

EN6704  INDUSTRIAL WASTE MANAGEMENT  LT P C

OBJECTIVES:
• To impart knowledge on sources and characteristics of various industrial wastes and strategies for its prevention and control

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

UNIT II  CLEANER PRODUCTION  8

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

TEXT BOOKS:

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 I  SOURCES AND EFFECTS OF AIR POLLUTANTS  9

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
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.

TEXT BOOKS:

REFERENCES:

EN6501  MUNICIPAL SOLID WASTE MANAGEMENT  L T P C  3 0 0 3

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
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

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:

CE6012  GROUND IMPROVEMENT TECHNIQUES  L T P C
3 0 0 3

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
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  DEWATERING
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

UNIT IV  EARTH REINFORCEMENT
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


TOTAL: 45 PERIODS

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.

TEXT BOOKS:


REFERENCES:

8. IS15284(Par t 1) : 2003 “Design and Construction for Ground Improvement – Guidelines” (Stone Column), Bureau of Indian Standards, New Delhi, 2003

CE6013 BRIDGE STRUCTURES LT P C 3 0 0 3

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, ie., 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.

TEXT BOOKS:

REFERENCES:

CE6014 STORAGE STRUCTURES LT P C 3 0 0 3

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

UNIT V PRESTRESSED CONCRETE WATER TANKS
Principles of circular prestressing – Design of prestressed concrete circular water tanks

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

TEXT BOOKS:

REFERENCES:

CE6015 TALL BUILDINGS

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.

TEXT BOOKS:

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.

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.

TEXT BOOKS:
1. CBRI, Building materials and components, India, 1990
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

UNIT V BRITTLE COATINGS

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.

TEXT BOOKS:

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

UNIT I INTRODUCTION

UNIT II TQM PRINCIPLES
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
The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT IV TQM TOOLS AND TECHNIQUES II

UNIT V QUALITY SYSTEMS

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:

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

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

UNIT IV DESIGN AND OPTIMIZATION
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
Introduction to artificial intelligence - Knowledge based expert systems – Applications of KBES- Rules and decision tables - Inference mechanisms - simple applications

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

TEXT BOOKS:

REFERENCES:

CE6019 INDUSTRIAL STRUCTURES

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

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

UNIT II FUNCTIONAL REQUIREMENTS

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

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

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.

TEXT BOOKS:

REFERENCES:

CE6020 FINITE ELEMENT TECHNIQUES L T P C 3 0 0 3

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

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UNIT V APPLICATIONS OF FEM
Plate Bending Problems - Finite Elements for Elastic Stability - Finite Elements in Fluid Mechanics - Dynamic Analysis

TOTAL: 45 PERIODS

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

TEXT BOOKS:

REFERENCES:

CE6021 REPAIR AND REHABILITATION OF STRUCTURES

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.

TEXT BOOKS:

REFERENCES:

CE6022     EARTHQUAKE GEOTECHNICAL ENGINEERING

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 EARTHQUAKES

UNIT II     DYNAMIC PROPERTIES OF SOILS

UNIT III    SEISMIC HAZARD ANALYSIS

UNIT IV     GROUND RESPONSE ANALYSIS

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UNIT V  LIQUEFACTION ANALYSIS

Liquefaction – Flow liquefaction – Cyclic Mobility – Evaluation of liquefaction Hazards –
Liquefaction Susceptibility – Criteria – Historical Geologic – Compositional – State – Evaluation of
Initiation of Liquefaction – Cyclic stress approach – Characterization of Liquefaction Resistance –
SPT Test – Various correction factor – Factor of Safety.

TOTAL: 45 PERIODS

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

TEXT BOOKS:
1. Krammer S.L., "Geotechnical Earthquake Engineering", Prentice Hall, International Series,
Pearson Education Inc and Donling Kindersley Publishing Inc. 2013
& Francis Group, 2009.

REFERENCES:
Delhi, 2000.
Delhi, 1998.
Institute, 2004.
House, New Delhi, India, 2006.
5. Wai-Fah Chen and Cgharles Scawthem, “Earthquake Engineering Hand book”, Caspress,
2003.
PROGRAM EDUCATIONAL OBJECTIVES:

1. To prepare the students have successful career in industry and motivate for higher education.
2. To provide strong foundation in basic science and mathematics necessary to formulate, solve and analyze Electronics and Instrumentation problems.
3. To provide strong foundation in circuit theory, control theory and signal processing concepts.
4. To provide good knowledge of Instrumentation systems and their applications.
5. To provide knowledge on basic electronics and their applications in Instrumentation engineering.
6. To provide an opportunity to work in interdisciplinary groups.
7. To promote student awareness for life long learning and inculcate professional ethics.
8. To provide necessary foundation on computational platforms and software applications related to the respective field of engineering.

PROGRAM OUTCOMES:

a) Ability to understand and apply differential equations, integrals, matrix theory, probability theory and Laplace, Fourier and Z transformations for engineering problems.
b) Ability to understand and apply basic science, circuit theory, control theory and signal processing concepts to engineering problems.
c) Ability to model and analyze transducers.
d) Ability to understand and analyze Instrumentation systems and their applications to various industries.
e) Ability to understand and analyse process control engineering problems.
f) Ability to understand and analyse linear and digital electronic circuits.
g) Ability to review, prepare and present technological developments.
h) Ability to form a group and develop or solve engineering hardware and problems.
i) To understand and apply computing platform and software for engineering problems.
j) To understand ethical issues environmental impact and acquire management skills.

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ANNA UNIVERSITY, CHENNAI
AFFILIATED INSTITUTIONS
R – 2013
B. E. ELECTRONICS AND INSTRUMENTATION ENGINEERING
I TO VIII SEMESTERS CURRICULUM AND SYLLABUS

SEMESTER I

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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 9+3
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 9+3
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 9+3
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 9+3
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

- Project
- Assignment
- Reviews
- Creative writing
- Poster making, etc.

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

UNIT II  SEQUENCES AND SERIES  

UNIT III  APPLICATIONS OF DIFFERENTIAL CALCULUS  
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  

UNIT V  MULTIPLE INTEGRALS  

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.

TEXT BOOKS:

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

UNIT I  CRYSTAL PHYSICS
Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, 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
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

UNIT III QUANTUM PHYSICS

UNIT IV  ACOUSTICS AND ULTRASONICS
Production of ultrasonics 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.

TOTAL: 45 PERIODS

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.

TEXT BOOKS:
1. Arumugam M. Engineering Physics. Anuradha publishers, 2010
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 polydispersity 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 isochore (problems).

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY

UNIT IV PHASE RULE AND ALLOYS


UNIT V NANOCHEMISTRY

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.

TEXT BOOKS:

REFERENCES:

GE6151 COMPUTER PROGRAMMING

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
Problem formulation - Problem Solving - Introduction to 'C' programming - fundamentals - structure of a 'C' program - compilation and linking processes - Constants, Variables - Data Types - Expressions using operators in 'C' - Managing Input and Output operations - Decision Making and Branching - Looping statements - solving simple scientific and statistical problems.

UNIT III ARRAYS AND STRINGS
Arrays - Initialization - Declaration - One dimensional and Two dimensional arrays. String operations - String Arrays. Simple programs - sorting - searching - matrix operations.

UNIT IV FUNCTIONS AND POINTERS
Function - definition of function - Declaration of function - Pass by value - Pass by reference - Recursion - Pointers - Definition - Initialization - Pointers arithmetic - Pointers and arrays - Example Problems.

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) 1
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 5+9
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 5+9
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 5+9
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 5+9
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 6+9
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) 3
Introduction to drafting packages and demonstration of their use.

TOTAL : 75 PERIODS
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.

TEXT BOOK:

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.
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:
1. Search, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions – Includes Parameter Passing
9. Program using Recursive Function and conversion from given program to flow chart.
10. 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.
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

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-phenantroline / 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, porcelain tile, dropper (each 30 Nos.)

HS6251 TECHNICAL ENGLISH II

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

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

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

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
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.

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

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%
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 9+3
Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green’s theorem in a plane, Gauss divergence theorem and Stokes’ theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.

UNIT II ORDINARY DIFFERENTIAL EQUATIONS 9+3
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 9+3

UNIT IV ANALYTIC FUNCTIONS 9+3
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, z², e^z and bilinear transformation.

UNIT V COMPLEX INTEGRATION 9+3
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.

TEXT BOOKS:


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
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

UNIT V  ADVANCED ENGINEERING MATERIALS


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.

TEXT BOOKS:

REFERENCES:

UNIT I  WATER TECHNOLOGY

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

CY6251 ENGINEERING CHEMISTRY - II

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

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 III ENERGY SOURCES 9
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 9
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 9

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.

TEXT BOOKS:

REFERENCES:
OBJECTIVES

- To impart basic knowledge on Civil and Mechanical Engineering.
- To explain the materials used for the construction of civilized structures.
- To make the understand the fundamentals of construction of structure.
- To explain the component of power plant units and detailed explanation to IC engines their working principles.
- To explain the R & AC system.

A – CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS 15


UNIT II BUILDING COMPONENTS AND STRUCTURES 15
Foundations: Types, Bearing capacity – Requirement of good foundations.

TOTAL: 30 PERIODS

B – MECHANICAL ENGINEERING

UNIT III POWER PLANT ENGINEERING 10

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

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM 10

TOTAL: 30 PERIODS

OUTCOMES:

- Ability to explain the usage of construction material and proper selection of construction materials.
- Ability to design building structures.
- Ability to identify the components use in power plant cycle.
- Ability to demonstrate working principles of petrol and diesel engine.
- Ability to explain the components of refrigeration and Air conditioning cycle.

TEXT BOOKS:

REFERENCES:

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<th>CIRCUIT THEORY</th>
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OBJECTIVES:
- To introduce electric circuits and its analysis
- To impart knowledge on solving circuits using network theorems
- To introduce the phenomenon of resonance in coupled circuits.
- To educate on obtaining the transient response of circuits.
- To Phasor diagrams and analysis of three phase circuits

UNIT I BASIC CIRCUITS ANALYSIS 12

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

UNIT III RESONANCE AND COUPLED CIRCUITS 12

UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS 12
Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input – Characterization of two port networks in terms of Z,Y and h parameters.

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

TOTAL : 60 PERIODS
OUTCOMES:
- Ability analyse electrical circuits
- Ability to apply circuit theorems
- Ability to analyse AC and DC Circuits

TEXT BOOKS:

REFERENCES:

GE6262 PHYSICS AND CHEMISTRY LABORATORY – II
L T P C
0 0 2 1

PHYSICS LABORATORY – II

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)
OBJECTIVES:
The Students should be made to
- Be exposed to Unix shell commands
- Be familiar with an editor on Unix
- Learn to program in Shell script
- Learn to write C programme for Unix platform

LIST OF EXPERIMENTS

1. UNIX COMMANDS 15
Study of Unix OS - Basic Shell Commands - Unix Editor

2. SHELL PROGRAMMING 15
Simple Shell program - Conditional Statements - Testing and Loops

3. C PROGRAMMING ON UNIX 15
Dynamic Storage Allocation-Pointers-Functions-File Handling

OUTCOMES:
At the end of the course the students should be able to:
- Use Shell commands
- Design of Implement Unix shell scripts
- Write and execute C programs on Unix

HARDWARE / SOFTWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS

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

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

- To provide practical experience with simulation of electrical circuits and verifying circuit theorems.

LIST OF EXPERIMENTS

1. Experimental verification of Kirchhoff’s voltage and current laws
2. Experimental verification of network theorems (Thevenin, Norton, Superposition and maximum power transfer Theorem).
3. Study of CRO and measurement of sinusoidal voltage, frequency and power factor.
4. Experimental determination of time constant of series R-C electric circuits.
5. Experimental determination of frequency response of RLC circuits.
6. Design and Simulation of series resonance circuit.
7. Design and Simulation of parallel resonant circuits.
8. Simulation of low pass and high pass passive filters.
9. Simulation of three phase balanced and unbalanced star, delta networks circuits.
10. Experimental determination of power in three phase circuits by two-watt meter method.
11. Calibration of single phase energy meter.
12. Determination of two port network parameters.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to understand and apply circuit theorems and concepts in engineering applications.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

2. Function Generator (1 MHz) - 10 Nos.
4. Oscilloscope (20 MHz) - 10 Nos.
5. Digital Storage Oscilloscope (20 MHz) – 1 No.
6. Circuit Simulation Software (5 Users) (Pspice / Matlab /other Equivalent software Package) with PC (5 Nos.) and Printer (1 No.)
7. AC/DC - Voltmeters (10 Nos.), Ammeters (10 Nos.) and Multi-meters (10 Nos.)
9. Decade Resistance Box, Decade Inductance Box, Decade Capacitance Box Each - 6 Nos.
10. Circuit Connection Boards - 10 Nos.

Necessary Quantities of Resistors, Inductors, Capacitors of various capacities (Quarter Watt to 10 Watt)
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 9+3


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

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:

GE6351  ENVIRONMENTAL SCIENCE AND ENGINEERING  L T P C  3 0 0 3

OBJECTIVES:
To the study of nature and the 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  12
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  10
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

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

36
TEXT BOOKS:

REFERENCES:

EE6301 DIGITAL LOGIC CIRCUITS

OBJECTIVES:
- To study various number systems, simplify the logical expressions using Boolean functions
- To study implementation of combinational circuits
- To design various synchronous and asynchronous circuits.
- To introduce asynchronous sequential circuits and PLCs
- To introduce digital simulation for development of application oriented logic circuits.

UNIT I NUMBER SYSTEMS AND DIGITAL LOGIC FAMILIES
Review of number systems, binary codes, error detection and correction codes (Parity and Hamming code) - Digital Logic Families, comparison of RTL, DTL, TTL, ECL and MOS families - operation, characteristics of digital logic family.

UNIT II COMBINATIONAL CIRCUITS
Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps - simplification and implementation of combinational logic - multiplexers and demultiplexers - code converters, adders, subtractors.

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS
Sequential logic- SR, JK, D and T flip flops - level triggering and edge triggering - counters - asynchronous and synchronous type - Modulo counters - Shift registers - design of synchronous sequential circuits – Moore and Melay models- Counters, state diagram; state reduction; state assignment.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS AND PROGRAMMABLE LOGIC DEVICES
Asynchronous sequential logic circuits-Transition table, flow table-race conditions, hazards & errors in digital circuits; analysis of asynchronous sequential logic circuits-introduction to Programmable Logic Devices: PROM – PLA – PAL.

UNIT V VHDL

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

**OUTCOMES:**
- Ability to understand and analyse, linear and digital electronic circuits.

**TEXT BOOKS:**

**REFERENCES:**

<table>
<thead>
<tr>
<th>EC6202</th>
<th>ELECTRONIC DEVICES AND CIRCUITS</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>L T P C</td>
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<td></td>
<td>3 1 0 4</td>
</tr>
</tbody>
</table>

**OBJECTIVES:**
The student should be made to:
- Be familiar with the structure of basic electronic devices.
- Be exposed to the operation and applications of electronic devices.

**UNIT I – PN JUNCTION DEVICES**
PN junction diode –structure, operation and V-I characteristics, diffusion and transient capacitance - Rectifiers – Half Wave and Full Wave Rectifier,– Display devices- LED, Laser diodes- Zener diode-characteristics-Zener Reverse characteristics – Zener as regulator

**UNIT II – TRANSISTORS**
BJT, JFET, MOSFET- structure, operation, characteristics and Biasing UJT, Thyristor and IGBT - Structure and characteristics.
UNIT III  AMPLIFIERS  9
BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response –
MOSFET small signal model– Analysis of CS and Source follower – Gain and frequency response-
High frequency analysis.

UNIT IV  MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER  9
BIMOS cascade amplifier, Differential amplifier – Common mode and Difference mode analysis – FET
input stages – Single tuned amplifiers – Gain and frequency response – Neutralization methods,
power amplifiers –Types (Qualitative analysis).

UNIT V  FEEDBACK AMPLIFIERS AND OSCILLATORS  9
Advantages of negative feedback – voltage / current, series , Shunt feedback –positive feedback –
Condition for oscillations, phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators.

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

OUTCOMES:
• To explain the structure of the basic electronic devices.
• To design applications using the basic electronic devices.

TEXT BOOKS:

REFERENCES:
5. Robert B. Northrop, “Analysis and Application of Analog Electronic Circuits to Biomedical

EE6303  LINEAR INTEGRATED CIRCUITS AND APPLICATIONS  L T P C
3 0 0 3

OBJECTIVES:
• To study the IC fabrication procedure.
• To study characteristics; realize circuits; design for signal analysis using Op-amp ICs.
• To study the applications of Op-amp.
• To study internal functional blocks and the applications of special ICs like Timers, PLL
circuits, regulator Circuits, ADCs.

UNIT I  IC FABRICATION  9
IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching,
diffusion of impurities. Realisation of monolithic ICs and packaging. Fabrication of diodes,
capacitance, resistance and FETs.

UNIT II  CHARACTERISTICS OF OPAMP  9
Ideal OP-AMP characteristics, DC characteristics, AC characteristics, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp – Inverting and Non-inverting Amplifiers-V/I & I/V converters, summer, differentiator and integrator.

**UNIT III APPLICATIONS OF OPAMP**

Instrumentation amplifier, Log and Antilog Amplifiers, first and second order active filters, comparators, multivibrators, waveform generators, clippers, clamps, peak detector, S/H circuit, D/A converter (R-2R ladder and weighted resistor types), A/D converters using opamps.

**UNIT IV SPECIAL ICs**

Functional block, characteristics & application circuits with 555 Timer IC-566 voltage controlled oscillator IC; 565-phase lock loop IC, Analog multiplier ICs.

**UNIT V APPLICATION ICs**

IC voltage regulators –LM78XX,79XX Fixed voltage regulators - LM317, 723 Variable voltage regulators, switching regulator- SMPS- LM 380 power amplifier- ICL 8038 function generator IC

**TOTAL : 45 PERIODS**

**OUTCOMES:**
- Ability to understand and analyse, linear and digital electronic circuits.

**TEXT BOOKS:**

**REFERENCES:**

**EI6301 ELECTRICAL MEASUREMENTS**

**OBJECTIVES:**
- To introduce the meters used to measure current & voltage.
- To have an adequate knowledge in the measurement techniques for power and energy, power and energy meters are included.
- To provide Elaborate discussion about potentiometer & instrument transformers.
- To provide Detailed study of resistance measuring methods.
- To provide Detailed study of inductance and capacitance measurement.

**UNIT I MEASUREMENT OF VOLTAGE AND CURRENT**

UNIT II  MEASUREMENT OF POWER AND ENERGY  
Electrodynamometer type wattmeter – Theory & its errors – Methods of correction – LPF wattmeter–Phantom loading – Induction type kWh meter – Induction type energy meter – Calibration of wattmeter and Energy meter

UNIT III  POTENTIOMETERS & INSTRUMENT TRANSFORMERS  
DC potentiometer – Basic circuit, standardization – Laboratory type (Crompton’s) – AC potentiometer Drysdale (polar type) type – Gall-Tinsley (coordinate) type – Limitations & applications – Instrument Transformer:-C.T and P.T construction, theory, operation and characteristics.

UNIT IV  RESISTANCE MEASUREMENT  

UNIT V  IMPEDANCE MEASUREMENT  

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

OUTCOMES:
• Ability to understand and apply basic science, circuit theory, control theory and signal processing concepts to engineering problems.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
To enable the students to understand the behavior of semiconductor device based on experimentation

LIST OF EXPERIMENTS:

1. Characteristics of Semi conductor diode and Zener diode
2. Characteristics of a NPN Transistor under common emitter, common collector and common base configurations
3. Characteristics of JFET (Draw the equivalent circuit)
4. Characteristics of UJT and generation of saw tooth waveforms
5. Design and Frequency response characteristics of a Common Emitter amplifier
6. Characteristics of photo diode & photo transistor, Study of light activated relay circuit
7. Design and testing of RC phase shift, LC oscillators
8. Single Phase half-wave and full wave rectifiers with inductive and capacitive filters
9. Differential amplifiers using FET
10. Study of CRO for frequency and phase measurements
11. Astable and Monostable multivibrators
12. Realization of passive filters

OUTCOMES:

- Ability to understand and analyse, linear and digital electronic circuits.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Semiconducter devices like Diode, Zener Diode, NPN Transistors, JFET, UJT, Photo diode, Photo Transistor
2. Resistors, Capacitors and inductors
3. Necessary digital IC 8
4. Function Generators
5. Regulated 3 output Power Supply 5, ± 15V
6. CRO
7. Storage Oscilloscope
8. Bread boards
9. Atleast one demo module each for the listed equipments.
10. Component data sheets to be provided

TOTAL : 45 PERIODS
OBJECTIVES:
Working Practice in simulators / CAD Tools / Experiment test bench to learn design, testing and characterizing of circuit behaviour with digital and analog ICs.

LIST OF EXPERIMENTS:
1. Implementation of Boolean Functions, Adder/ Subtractor circuits.
2. Code converters: Excess-3 to BCD and Binary to Gray code converter and vice-versa
3. Parity generator and parity checking
4. Encoders and Decoders
5. Counters: Design and implementation of 4-bit modulo counters as synchronous and Asynchronous types using FF IC’s and specific counter IC.
6. Shift Registers: Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC’s.
7. Study of multiplexer and demultiplexer
8. Timer IC application: Study of NE/SE 555 timer in Astable, Monostable operation.
10. Study of VCO and PLL ICs:
   i. Voltage to frequency characteristics of NE/ SE 566 IC.
   ii. Frequency multiplication using NE/SE 565 PLL IC.

OUTCOMES:
- Ability to understand and analyse, linear and digital electronic circuits.

TOTAL : 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

<table>
<thead>
<tr>
<th>S.No</th>
<th>Name of the equipments / Components</th>
<th>Quantity Required</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dual ,(0-30V) variable Power Supply</td>
<td>10</td>
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<tr>
<td>2</td>
<td>CRO</td>
<td>9</td>
<td>30MHz</td>
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<tr>
<td>3</td>
<td>Digital Multimeter</td>
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<tr>
<td>4</td>
<td>Function Generator</td>
<td>8</td>
<td>1 MHz</td>
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<tr>
<td>5</td>
<td>IC Tester (Analog)</td>
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<tr>
<td>6</td>
<td>Bread board</td>
<td>10</td>
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<tr>
<td>7</td>
<td>Computer (PSPICE installed)</td>
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<tr>
<td>Consumables (Minimum of 25 Nos. each)</td>
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<tr>
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<td>IC 741/ IC NE555/566/565</td>
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<tr>
<td>2</td>
<td>Digital IC types</td>
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<tr>
<td>3</td>
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<td>4</td>
<td>LM317</td>
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<td>5</td>
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<td>9</td>
<td>Zener diodes</td>
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<td>11</td>
<td>Step-down transformer</td>
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<td>12</td>
<td>Capacitor</td>
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<td>13</td>
<td>Resistors 1/4 Watt Assorted</td>
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<td>14</td>
<td>Single Strand Wire</td>
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</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

**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


UNIT V

BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS

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

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

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.

TEXT BOOKS:


REFERENCES:

OBJECTIVES:
• To get a clear understanding of object-oriented concepts.
• To understand object oriented programming through C++.

UNIT I OVERVIEW
Why Object Oriented Programming in C++ - Native Types and Statements – Functions and Pointers - Implementing ADTs in the Base Language.

UNIT II BASIC CHARACTERISTICS OF OOP
Data Hiding and Member Functions - Object Creation and Destruction - Polymorphism data abstraction: Iterators and Containers.

UNIT III ADVANCED PROGRAMMING

UNIT IV OVERVIEW OF JAVA
Data types, variables and arrays, operators, control statements, classes, objects, methods – Inheritance.

UNIT V EXCEPTION HANDLING
Packages and Interfaces, Exception handling, Multithreaded programming, Strings, Input/Output

TOTAL : 45 PERIODS

OUTCOMES:
• Gain the basic knowledge on Object Oriented concepts.
• Ability to develop applications using Object Oriented Programming Concepts.
• Ability to implement features of object oriented programming to solve real world problems.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To understand how physical quantities are measured and how they are converted to electrical or other forms.
- To have an adequate knowledge in resistance, transducers.
- To develop the knowledge of inductance and capacitance transducers.
- To study the characteristics of Transducers.
- To impart knowledge on various types of transducers

UNIT I SCIENCE OF MEASUREMENTS AND CLASSIFICATION OF TRANSDUCERS

UNIT II CHARACTERISTICS OF TRANSDUCERS

UNIT III VARIABLE RESISTANCE TRANSDUCERS
Principle of operation, construction details, characteristics and applications of potentiometer, strain gauge, resistance thermometer, Thermistor, hot-wire anemometer, piezoresistive sensor and humidity sensor.

UNIT IV VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE TRANSDUCERS
Induction potentiometer – Variable reluctance transducers – EI pick up – Principle of operation, construction details, characteristics and applications of LVDT –Capacitive transducer and types – Capacitor microphone – Frequency response.

UNIT V OTHER TRANSDUCERS
Piezoelectric transducer - Hall Effect transducer – Magneto elastic sensor- Digital transducers – Smart sensors - Fibre optic sensors- Film sensors-Introduction to MEMS and Nano sensors.

TOTAL : 45 PERIODS

OUTCOMES:
- Ability to model and analyze transducers.

TEXT BOOKS:

REFERENCES:
EE6403  DISCRETE TIME SYSTEMS AND SIGNAL PROCESSING  L T P C
                                   3 0 0 3

OBJECTIVES:

- To classify signals and systems & their mathematical representation.
- To analyse the discrete time systems.
- To study various transformation techniques & their computation.
- To study about filters and their design for digital implementation.
- To study about a programmable digital signal processor & quantization effects.

UNIT I  INTRODUCTION

Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect.

UNIT II  DISCRETE TIME SYSTEM ANALYSIS

Z-transform and its properties, inverse z-transforms; difference equation – Solution by z-transform, application to discrete systems - Stability analysis, frequency response – Convolution – Discrete Time Fourier transform, magnitude and phase representation.

UNIT III  DISCRETE FOURIER TRANSFORM & COMPUTATION


UNIT IV  DESIGN OF DIGITAL FILTERS

FIR & IIR filter realization – Parallel & cascade forms. FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics. Analog filter design – Butterworth and Chebyshev approximations; IIR Filters, digital design using impulse invariant and bilinear transformation - mWarping, pre warping.

UNIT V  DIGITAL SIGNAL PROCESSORS


TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand and apply basic science, circuit theory, Electro-magnetic field theory control theory and apply them to electrical engineering problems.

TEXT BOOKS:

REFERENCES:

EI6402 ELECTRICAL MACHINES

OBJECTIVES:
- To introduce the principles of operations of DC machines as motor and generator
- To introduce the principles of operations of Transformers
- To introduce the principles of operations of Induction machines
- To introduce the principles of operations of Synchronous machines
- To introduce other special machines

UNIT I D.C. MACHINES
D.C. Machines – Principle of operation and construction of motor and generator – torque and EMI equation – Various excitation schemes – Characteristics of Motor and Generator – Starting, Speed control and braking of D.C. Motor

UNIT II TRANSFORMERS
Principle, Construction and Types of Transformer - EMF equation - Equivalent circuits - Phasor diagrams - Regulation and efficiency of a transformer-three phase transformer Connection

UNIT III SYNCHRONOUS MACHINES
Principle of Operation, type - EMF Equation and Phasor diagrams - Synchronous motor-Rotating Magnetic field Starting Methods, Torque V-Curves, inverted – V curves

UNIT IV THREE PHASE INDUCTION MOTORS
Induction motor-principle of operation, Types - Torque-slip characteristics - Starting methods and Speed control of induction motors.

UNIT V SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES

TOTAL (L:45+T:15): 60 PERIODS
OUTCOMES:
- Ability to understand and analyze Instrumentation systems and their applications to various industries.

TEXT BOOKS:

REFERENCES:

EI6403 APPLIED THERMODYNAMICS AND FLUID DYNAMICS

OBJECTIVES:
- To explain the various laws of thermodynamics
- To explain the operation of boiler
- To explain the different types of pumps and turbines
- To explain the concept of flow through the closed conduit.

UNIT I LAWS OF THERMODYNAMICS AND BASIC IC ENGINE CYCLES
- Systems zeroth law, first law of thermodynamics – concept of internal energy and enthalpy applications to closed and open systems – second law of thermodynamics – concept of entropy – clausius inequality and principles of increase in irreversible processes. Basic IC engine and gas turbine cycles—single and multistage reciprocating compressors.

UNIT II THERMODYNAMICS OF REFRIGERATORS AND PUMPS
- Properties of steam – Ranking cycle—Boilers and its accessories— Basic thermodynamics of refrigerators and heat pumps.-Basics of Heat transfer

UNIT III BASIC CONCEPT OF FLUID MECHANICS & FLOW OF FLUIDS

UNIT IV DIMENSIONAL AND MODEL ANALYSIS

UNIT V PUMPS AND TURBINES

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

OUTCOMES:
• Ability to understand and analyze Instrumentation systems and their applications to various industries.

TEXT BOOKS:

REFERENCES:

CS6461 OBJECT ORIENTED PROGRAMMING LABORATORY L T P C
0 0 3 2

OBJECTIVES:
• To get a clear understanding of object-oriented concepts.
• To understand object oriented programming through C++ & JAVA.

LIST OF EXPERIMENTS:
C++:
1. program using functions
   • functions with default arguments
   • implementation of call by value, address, reference
2. simple classes for understanding objects, member functions & constructors
   • classes with primitive data members,
   • classes with arrays as data members
   • classes with pointers as data members
   • classes with constant data members
- classes with static member functions

3. compile time polymorphism
   - operator overloading
   - function overloading

4. run time polymorphism
   - inheritance
   - virtual functions
   - virtual base classes
   - templates

5. file handling
   - sequential access
   - random access

JAVA:

6. simple java applications
   - for understanding references to an instant of a class
   - handling strings in JAVA

7. simple package creation
   - developing user defined packages in java

8. interfaces
   - developing user defined interfaces
   - use predefined interfaces

9. threading
   - creation of threading in java applications
   - multi threading

10. exception handling mechanism in java
    - handling predefined exceptions
    - handling user defined exceptions

TOTAL :45 PERIODS

OUTCOMES:
- Gain the basic knowledge on Object Oriented concepts.
- Ability to develop applications using Object Oriented Programming Concepts.
- Ability to implement features of object oriented programming to solve real world problems.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

- Standalone desktops with C++ compiler  30 Nos.
  
  (or)

- Server with C++ compiler supporting 30 terminals or more.
ELECTRICAL MACHINES LABORATORY

OBJECTIVES:
To impart hands on experience in verification of circuit laws and theorems, measurement of circuit parameters, study of circuit characteristics and simulation of time response. To expose the students to the basic operation of electrical machines and help them to develop experimental skills.

LIST OF EXPERIMENTS:
1. Open circuit characteristics of D.C. shunt generator.
2. Load characteristics of D.C. shunt generator.
3. Load test on D.C. shunt motor.
4. Load test on D.C. series motor.
5. Swinburne’s test
6. speed control of D.C. shunt motor.
7. Load test on single phase transformer
8. open circuit and short circuit tests on single phase transformer(Determination of equivalent circuit parameters).
9. Load test on single phase induction motor.
10. No load and blocked rotor tests on three phase induction motor (Determination of equivalent circuit parameters)
11. Load test on Three phase induction motor.
12. Study of Starters

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to understand and analyze Instrumentation systems and their applications to various industries

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
1. DC Shunt Motor with Loading Arrangement – 3 nos
2. Single Phase Transformer – 4 nos
3. DC Series Motor with Loading Arrangement – 1 No.
4. Three Phase Induction Motor with Loading Arrangement – 2 nos
5. Single Phase Induction Motor with Loading Arrangement – 1 No.
6. DC Shunt Motor Coupled With DC Compound Generator – 2 nos
7. DC Shunt Motor Coupled With DC Shunt Generator – 1 No.
8. Tachometer -Digital/Analog – 8 nos
9. Single Phase Auto Transformer – 2 nos
10. Three Phase Auto Transformer – 1 No.
11. Single Phase Resistive Loading Bank – 2 nos
12. Three Phase Resistive Loading Bank. – 2 nos
13. SPST switch – 2 nos
OBJECTIVES:

- To study the Architecture of uP8085 & uC 8051
- To study the addressing modes & instruction set of 8085 & 8051.
- To introduce the need & use of Interrupt structure 8085 & 8051.
- To develop skill in simple applications development with programming 8085 & 8051
- To introduce commonly used peripheral / interfacing

UNIT I 8085 PROCESSOR


UNIT II PROGRAMMING OF 8085 PROCESSOR

Instruction -format and addressing modes – Assembly language format – Data transfer, data manipulation& control instructions – Programming: Loop structure with counting & Indexing – Look up table - Subroutine instructions - stack.

UNIT III 8051 MICRO CONTROLLER


UNIT IV PERIPHERAL INTERFACING

Study on need, Architecture, configuration and interfacing, with ICs: 8255, 8259, 8254, 8237, 8251, 8279, - A/D and D/A converters &Interfacing with 8085& 8051

UNIT V MICRO CONTROLLER PROGRAMMING & APPLICATIONS


TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand and analyse, linear and digital electronic circuits.
- To understand and apply computing platform and software for engineering problems.

TEXT BOOKS:

REFERENCES:

IC6501 CONTROL SYSTEMS

OBJECTIVES:
- To understand the use of transfer function models for analysis physical systems and introduce the control system components.
- To provide adequate knowledge in the time response of systems and steady state error analysis.
- To accord basic knowledge in obtaining the open loop and closed-loop frequency responses of systems.
- To introduce stability analysis and design of compensators.
- To introduce state variable representation of physical systems and study the effect of state feedback.

UNIT I SYSTEMS AND THEIR REPRESENTATION

UNIT II TIME RESPONSE

UNIT III FREQUENCY RESPONSE
Frequency response – Bode plot – Polar plot – Determination of closed loop response from open loop response - Correlation between frequency domain and time domain specifications- Effect of Lag, lead and lag-lead compensation on frequency response- Analysis.

UNIT IV STABILITY AND COMPENSATOR DESIGN
Characteristics equation – Routh Hurwitz criterion – Nyquist stability criterion- Performance criteria – Lag, lead and lag-lead networks – Lag/Lead compensator design using bode plots.
UNIT V  STATE VARIABLE ANALYSIS


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

OUTCOMES:
- Ability to understand and apply basic science, circuit theory, theory control theory Signal processing and apply them to electrical engineering problems.

TEXT BOOKS:

REFERENCES:

EE6503  POWER ELECTRONICS

OBJECTIVES:
- To get an overview of different types of power semiconductor devices and their switching characteristics.
- To understand the operation, characteristics and performance parameters of controlled rectifiers.
- To study the operation, switching techniques and basics topologies of DC-DC switching regulators.
- To learn the different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.
- To study the operation of AC voltage controller and various configurations.

UNIT I  POWERSEMI-CONDUCTOR DEVICES

Study of switching devices, Diode, SCR,TRIAC, GTO, BJT, MOSFET, IGBT-Static and Dynamic characteristics - Triggering and commutation circuit for SCR- Design of Driver and snubber circuit.
UNIT II PHASE-CONTROLLED CONVERTERS

2-pulse, 3-pulse and 6-pulse converters— performance parameters —Effect of source inductance— Gate Circuit Schemes for Phase Control—Dual converters.

UNIT III DC TO DC CONVERTER


UNIT IV INVERTERS

Single phase and three phase voltage source inverters(both120°modeand180°mode)—Voltage& harmonic control—PWM techniques: Sinusoidal PWM, modified sinusoidal PWM - multiple PWM — Introduction to space vector modulation —Current source inverter.

UNIT V AC TO AC CONVERTERS

Single phase and Three phase AC voltage controllers—Control strategy- Power Factor Control – Multistage sequence control -single phase and three phase cyclo converters —Introduction to Matrix converters.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to understand and analyse, linear and digital electronic circuits.

TEXT BOOKS:


REFERENCES:

OBJECTIVES:
- To understand various techniques and methods of analysis which occur in the various regions of the spectrum.
- To study important methods of analysis of industrial gases.
- To understand the important radio chemical methods of analysis.

UNIT I COLORIMETRY AND SPECTROPHOTOMETRY

UNIT II CHROMATOGRAPHY

UNIT III INDUSTRIAL GAS ANALYZERS AND POLLUTION MONITORING INSTRUMENTS
Types of gas analyzers – Oxygen, NO₂ and H₂S types, IR analyzers, thermal conductivity analyzers, analysis based on ionization of gases. Air pollution due to carbon monoxide, hydrocarbons, nitrogen oxides, sulphur dioxide estimation - Dust and smoke measurements.

UNIT IV PH METERS AND DISSOLVED COMPONENT ANALYZERS
Principle of pH measurement, glass electrodes, hydrogen electrodes, reference electrodes, selective ion electrodes, ammonia electrodes, biosensors, dissolved oxygen analyzer – Sodium analyzer – Silicon analyzer.

UNIT V NUCLEAR MAGNETIC RESONANCE AND MICROSCOPIC TECHNIQUES

OUTCOMES:
- Ability to understand and analyze Instrumentation systems and their applications to various industries

TEXT BOOKS:
REFERENCES:

EI6502 INDUSTRIAL INSTRUMENTATION – I L T P C 3 0 0 3

OBJECTIVES:
- To introduce the measurement techniques of force, torque and speed
- To introduce the measurement techniques of acceleration, Vibration and density
- To introduce the pressure measurement techniques
- To introduce the temperature measurement techniques
- To introduce the high temperature measurement techniques

UNIT I MEASUREMENT OF FORCE, TORQUE AND SPEED
Electric balance - Different types of load cells - Hydraulic, Pneumatic, strain gauge-Magnetoelastic and Piezoelectric load cells - Different methods of torque measurement:- Strain gauge-Relative angular twist-Speed measurement:-Capacitive tacho-Drag cup type tacho-D.C and A.C tachogenerators - Stroboscope.

UNIT II MEASUREMENT OF ACCELERATION, VIBRATION AND DENSITY
Accelerometers :- LVDT, Piezoelectric, Strain gauge and Variable reluctance type accelerometers - Mechanical type vibration instruments - Seismic instruments as accelerometer - Vibration sensor - Calibration of vibration pickups - Units of density and specific gravity - Baume scale and API scale - Pressure type densitometers - Float type densitometers - Ultrasonic densitometer - gas densitometer.

UNIT III PRESSURE MEASUREMENT
Units of pressure - Manometers, different types, Elastic type pressure gauges, Bourdon tube, bellows and diaphragms - Electrical methods:- Elastic elements with LVDT and strain gauges - Capacitive type pressure gauge - Piezo resistive pressure sensor-Resonator pressure sensor - Measurement of vacuum-McLeod gauge-Thermal conductivity gauge-Ionization gauges - Cold cathode type and hot cathode type - calibration of pressure gauges - Dead weight tester.

UNIT IV TEMPERATURE MEASUREMENT - I
Definitions and standards - Primary and secondary fixed points - Calibration of thermometers - Different types of filled in system thermometers - Sources of errors in - filled in systems and their compensation - Bimetallic thermometers - RTD - characteristics and signal conditioning-3 lead and 4 lead RTDs - Thermistors.

UNIT V TEMPERATURE MEASUREMENT - II
Thermocouples - Laws of thermocouple - Fabrication of industrial thermocouples - Signal conditioning for thermocouple - isothermal block reference junctions - Commercial circuits for cold
junction compensation - Response of thermocouple - Special techniques for measuring high temperature using thermocouple - Radiation fundamentals - Radiation methods of temperature measurement - Total radiation pyrometers - Optical pyrometers - Two colour radiation pyrometers - Fiber optic sensor for temperature measurement.

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to understand and analyze Instrumentation systems and their applications to various industries

TEXT BOOKS:

REFERENCES:

EE6612 MICROPROCESSORS AND MICROCONTROLLERS LABORATORY

OBJECTIVES:
To provide training on programming of microprocessors and microcontrollers and understand the interface requirements.

LIST OF EXPERIMENTS:
1. Simple arithmetic operations: addition / subtraction / multiplication / division.
2. Programming with control instructions:
   (i) Ascending / Descending order, Maximum / Minimum of numbers
   (ii) Programs using Rotate instructions
   (iii) Hex / ASCII / BCD code conversions.
3. Interface Experiments: with 8085
   (i) A/D Interfacing & D/A Interfacing.
4. Traffic light controller.
5. I/O Port / Serial communication
6. Programming Practices with Simulators/Emulators/open source
7. Read a key, interface display
8. Demonstration of basic instructions with 8051 Micro controller execution, including:
   (i) Conditional jumps, looping
(ii) Calling subroutines.
9. Programming I/O Port 8051
   (i) study on interface with A/D & D/A
   (ii) study on interface with DC & AC motor
10. Mini project development with processors.

OUTCOMES:
- Ability to understand and analyse, linear and digital electronic circuits.
- To understand and apply computing platform and software for engineering problems.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Description of Equipment</th>
<th>Quantity required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>8085 Microprocessor Trainer with Power Supply</td>
<td>15</td>
</tr>
<tr>
<td>2.</td>
<td>8051 Micro Controller Trainer Kit with power supply</td>
<td>15</td>
</tr>
<tr>
<td>3.</td>
<td>8255 Interface board</td>
<td>5</td>
</tr>
<tr>
<td>4.</td>
<td>8251 Interface board</td>
<td>5</td>
</tr>
<tr>
<td>5.</td>
<td>8259 Interface board</td>
<td>5</td>
</tr>
<tr>
<td>6.</td>
<td>8279 Keyboard / Display Interface board</td>
<td>5</td>
</tr>
<tr>
<td>7.</td>
<td>8254 timer counter</td>
<td>5</td>
</tr>
<tr>
<td>8.</td>
<td>ADC and DAC card</td>
<td>5</td>
</tr>
<tr>
<td>9.</td>
<td>AC &amp; DC motor with Controller</td>
<td>5</td>
</tr>
<tr>
<td>10.</td>
<td>Traffic Light Control System</td>
<td>5</td>
</tr>
</tbody>
</table>

EI6511 TRANSDUCERS AND MEASUREMENTS LABORATORY  L T P C  0 0 3 2

OBJECTIVES:
The aim of this lab is to fortify the students with an adequate work experience in the measurement of different quantities and also then expertise in handling the instruments involved.

LIST OF EXPERIMENTS:
1. Displacement versus output voltage characteristics of a potentiometric transducer.
2. Characteristics of Strain gauge and Load cell.
4. Characteristics of LDR, thermistor and thermocouple.
5. Step response characteristic of RTD and thermocouple.
6. Temperature measurements using RTD with three and four leads.
7. Fiber optic transducer for temperature or pressure measurement.
8. Wheatstone and Kelvin’s bridge for measurement of resistance.
9. Schering Bridge for capacitance measurement and Anderson Bridge for inductance measurement.
11. Calibration of Ammeter and Voltmeter using Student type potentiometer.
12. Design and calibration of series and shunt type ohmmeters.
13. One or two experiments beyond syllabus.
A separate laboratory manual incorporating Aim, apparatus required, circuit Diagram, graph, Result for each experiment has to be developed by the Department and given to the students

**TOTAL: 45 PERIODS**

**OUTCOMES:**
- Ability to model and analyze transducers.
- Ability to review, prepare and present technological developments

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

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potentiometer – Linear displacement transducer kit</td>
<td>1 No</td>
</tr>
<tr>
<td>Regulated power supply</td>
<td>8 No</td>
</tr>
<tr>
<td>FET voltmeter</td>
<td>1 No</td>
</tr>
<tr>
<td>Strain gauge and Load cell kit.</td>
<td>1 No</td>
</tr>
<tr>
<td>Variable power supply</td>
<td>1 No</td>
</tr>
<tr>
<td>Loads for measurement</td>
<td>one set</td>
</tr>
<tr>
<td>LVDT trainer kit</td>
<td>1 No.</td>
</tr>
<tr>
<td>Hall effect characteristics trainer</td>
<td>1 No.</td>
</tr>
<tr>
<td>Speed control trainer kit</td>
<td>1 No.</td>
</tr>
<tr>
<td>Multimeter</td>
<td>2 No.</td>
</tr>
<tr>
<td>Photo conductive trainer kit</td>
<td>1 No.</td>
</tr>
<tr>
<td>Thermistor Trainer kit</td>
<td>1 No.</td>
</tr>
<tr>
<td>Heater</td>
<td>1 No.</td>
</tr>
<tr>
<td>Thermistor</td>
<td>1 No.</td>
</tr>
<tr>
<td>Thermometer</td>
<td>1 No.</td>
</tr>
<tr>
<td>Thermocouple trainer kit</td>
<td>1 No.</td>
</tr>
<tr>
<td>Thermocouple and RTD trainer kit</td>
<td>1 No.</td>
</tr>
<tr>
<td>Thermocouple and RTD sensors</td>
<td>1 No.</td>
</tr>
<tr>
<td>I/P trainer kit</td>
<td>1 No.</td>
</tr>
<tr>
<td>Pressure source</td>
<td>1 No.</td>
</tr>
<tr>
<td>Control valve etc</td>
<td>1 No.</td>
</tr>
<tr>
<td>Galvanometer</td>
<td>2 No.</td>
</tr>
<tr>
<td>Bread board</td>
<td>5 No.</td>
</tr>
<tr>
<td>Decade resistance box</td>
<td>5 No.</td>
</tr>
<tr>
<td>Multimeter</td>
<td>3 No.</td>
</tr>
<tr>
<td>Fixed resistance</td>
<td>1 No.</td>
</tr>
<tr>
<td>Unknown resistors</td>
<td>1 No.</td>
</tr>
<tr>
<td>Decade Capacitance box</td>
<td>1 No.</td>
</tr>
<tr>
<td>CRO</td>
<td>3 No.</td>
</tr>
<tr>
<td>Function Generator</td>
<td>1 No.</td>
</tr>
<tr>
<td>Decade Inductance box</td>
<td>1 No.</td>
</tr>
<tr>
<td>Wattmeter</td>
<td>3 No.</td>
</tr>
<tr>
<td>Voltmeter</td>
<td>7 No.</td>
</tr>
<tr>
<td>Ammeter</td>
<td>4 No.</td>
</tr>
<tr>
<td>Resistive load</td>
<td>1 No.</td>
</tr>
<tr>
<td>Standard ammeter</td>
<td>1 No.</td>
</tr>
<tr>
<td>Standard voltmeter</td>
<td>1 No.</td>
</tr>
<tr>
<td>Auto transformer</td>
<td>1 No.</td>
</tr>
<tr>
<td>Ohmmeter (Analog Multimeter)</td>
<td>1 No.</td>
</tr>
<tr>
<td>Energy meter</td>
<td>1 No.</td>
</tr>
<tr>
<td>Fibre optic transducer</td>
<td>1 No.</td>
</tr>
</tbody>
</table>
OBJECTIVES:
- To provide opportunities to learners to practice their communicative skills to make them become proficient users of English.
- To enable learners to fine-tune their linguistic skills (LSRW) with the help of technology to communicate globally.
- To enhance the performance of learners at placement interviews and group discussions and other recruitment procedures.

UNIT I LISTENING/VIEWING
Listening and note-taking – Listening to telephonic conversations – Ted talks – Inspiring Speeches – Watching documentaries on personalities, places, socio-cultural events, TV news programmes and discussions to answer different kinds questions, viz., identifying key idea and comprehension questions… so on.

UNIT II SPEAKING

UNIT III READING
Different genres of text (literature, media, technical) for comprehension – Reading strategies like note-making – reading graphs, charts and graphic organizer – Sequencing sentences – reading online sources like e-books, e-journals and e-newspapers.

UNIT IV WRITING

UNIT V VOCABULARY
Idioms and Phrases – Proverbs – Collocations – Chunks of language.

UNIT VI GRAMMAR
Sentence structures – Subject-Verb agreement – Pronoun-Antecedent agreement – Tense forms – Active and passive voices – Direct and Indirect speeches – Cohesive devices.

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></td>
<td>1 No.</td>
</tr>
<tr>
<td></td>
<td>• PIV System</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 1 GB RAM / 40 GB HDD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• OS: Win 2000 server</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Audio card with headphones</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• JRE 1.3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td><strong>Client Systems</strong></td>
<td>60 Nos.</td>
</tr>
<tr>
<td></td>
<td>• PIII System</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 256 or 512 MB RAM / 40 GB HDD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• OS: Win 2000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Audio card with headphones</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• JRE 1.3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td><strong>Handicam</strong></td>
<td>1 No.</td>
</tr>
<tr>
<td>4</td>
<td><strong>Television 46”</strong></td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td><strong>Collar mike</strong></td>
<td>1 No.</td>
</tr>
<tr>
<td>6</td>
<td><strong>Cordless mike</strong></td>
<td>1 No.</td>
</tr>
<tr>
<td>7</td>
<td><strong>Audio Mixer</strong></td>
<td>1 No.</td>
</tr>
<tr>
<td>8</td>
<td><strong>DVD recorder/player</strong></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

- **Online Test** - 35 marks
- **Interview** - 15 marks
- **Presentation** - 15 marks
- **Group Discussion** - 15 marks

**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, case studies and abstract concept

**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:

WEB SOURCES:
www.humanresources.about.com
www.careerride.com

EI6601 MODERN ELECTRONIC INSTRUMENTATION

OBJECTIVES:
- To introduce different types of electronic voltmeters and their applications.
- To provide knowledge on various types of cathode ray oscilloscopes, their applications and different types of signal analyzers.
- To introduce different types of waveform generators and analyzers and their applications.
- To educate on virtual instrumentation, its applications, programming and DAQ cards and modules.
- To give exposure to telemetry, modulation techniques and multiplexing.

UNIT I ELECTRONIC INSTRUMENTS
Electronic Voltmeter and their advantages – Types, Differential amplifier, source follower, rectifier – True rms reading voltmeter – Electronic multimeter and ohmmeter – Current measurement – Power measurement - Microprocessor based DMM with auto ranging and self diagnostic features

UNIT II CATHODE RAY OSCILLOSCOPE & SIGNAL ANALYZERS
General purpose cathode ray oscilloscope – Dual trace, dual beam and sampling oscilloscopes– Analog and digital storage oscilloscope - frequency selective and heterodyne wave analyzer – Harmonic distortion analyzer – Spectrum analyzer

UNIT III WAVEFORM GENERATORS
Wien’s bridge and phase shift oscillators – Hartley and crystal oscillators – Square wave and pulse generators – Triangular wave-shape generator - Signal and function generators – Q meter – Electronic Counters
UNIT IV: VIRTUAL INSTRUMENTATION

Virtual instrumentation (VI) – Definition, flexibility – Block diagram and architecture of virtual instruments – Virtual instruments versus traditional instruments – Software in virtual instrumentation - VI programming techniques – DAQ cards for VI applications – DAQ modules with serial communication

UNIT V: TELEMETRY


TOTAL: 45 PERIODS

OUTCOMES:
- Ability to understand and analyze Instrumentation systems and their applications to various industries.

TEXT BOOKS:

REFERENCES:

EI6602: PROCESS CONTROL

OBJECTIVES:
- To introduce dynamics of various processes
- To educate on the effect of various control actions
- To impart knowledge on the final control elements
- To introduce the evaluation criteria and tuning techniques of controllers
- To introduce the concept of multi loop control techniques

UNIT I: PROCESS DYNAMICS

Need for process control – Mathematical model of Flow, Level, Pressure and Thermal processes – Interacting and non-interacting systems – Degrees of freedom – Continuous and batch processes –
Self regulation – Servo and regulatory operations – Lumped and Distributed parameter models – Heat exchanger – CSTR – Linearization of nonlinear systems.

**UNIT II**
**CONTROL ACTIONS**
9

**UNIT III**
**FINAL CONTROL ELEMENTS**
9
I/P converter - Pneumatic and electric actuators – Valve Positioner – Control Valves – Characteristic of Control Valves:- Inherent and Installed characteristics – Modeling of pneumatic control valve – Valve body:-Commercial valve bodies – Control valve sizing – Cavitation and flashing – Selection criteria.

**UNIT IV**
**CONTROLLER TUNING**
9
Evaluation criteria – IAE, ISE, ITAE and $\frac{1}{4}$ decay ratio - Tuning:- Process reaction curve method, Continuous cycling method and Damped oscillation method – Determination of optimum settings for mathematically described processes using time response and frequency response approaches – Auto tuning.

**UNIT V**
**MULTILOOP CONTROL**
9

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

**OUTCOMES:**
- Ability to understand and analyse process control engineering problems.

**TEXT BOOKS:**

**REFERENCES:**
OBJECTIVES:
- To introduce variable head type flow meters
- To introduce quantity meters, air flow meters and mass flow meters
- To educate on electrical type flow meters
- To educate on the level measurement techniques
- To educate on Viscosity, Humidity and Moisture content

UNIT I VARIABLE HEAD TYPE FLOWMETERS
Expression for flow rate through restriction (compressible and incompressible flow) - Orifice plate - different types of orifice plates - Cd variation - pressure tappings - Venturi tube - Flow nozzle - Dall tube - Pitot tube - combined pitot tube - averaging pitot tube - installation and applications of head flow meters

UNIT II QUANTITY METERS, AREA FLOW METERS AND MASS FLOW METERS

UNIT III ELECTRICAL TYPE FLOW METERS
Principle and constructional details of Electromagnetic flow meter - Ultrasonic flow meters - Laser Doppler anemometer - Vortex shedding flow meter - Target flow meter - Guidelines for selection of flow meter - Open channel flow measurement - Solid flow rate measurement

UNIT IV LEVEL MEASUREMENT
Level measurement: - Float gauges - Displacer type - D/P methods - Bubbler system - Load cell - Electrical types - Conductivity sensors - Capacitive sensors - Nucleonic gauge - Ultrasonic gauge - Boiler drum level measurement - Differential pressure method and Hydastep method - Solid level measurement

UNIT V MEASUREMENT OF VISCOSITY, HUMIDITY AND MOISTURE
Viscosity - Saybolt viscometer - Rotameter type viscometer - Consistency meters - Humidity - Dry and wet bulb psychrometers - Resistive and capacitive type hygrometers - Dew cell - Commercial type dew meter - Moisture measurement in solids - Conductivity sensor - Microwave and IR sensors

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to understand and analyze Instrumentation systems and their applications to various industries.

TEXT BOOKS:
REFERENCES:

EC6651 COMMUNICATION ENGINEERING

OBJECTIVES:
- To introduce different methods of analog communication and their significance
- To introduce Digital Communication methods for high bit rate transmission
- To introduce the concepts of source and line coding techniques for enhancing rating of transmission of minimizing the errors in transmission.
- To introduce MAC used in communication systems for enhancing the number of users.
- To introduce various media for digital communication

UNIT I ANALOG COMMUNICATION

UNIT II DIGITAL COMMUNICATION
Pulse modulations – concepts of sampling and sampling theormes, PAM, PWM, PPM, PTM, quantization and coding: DCM, DM, slope overload error. ADM, DPCM, OOK systems – ASK, FSK, PSK, BSK, QPSK, QAM, MSK, GMSK, applications of Data communication.

UNIT III SOURCE CODES, LINE CODES & ERROR CONTROL (Qualitative only)

UNIT IV MULTIPLE ACCESS TECHNIQUES
SS&MA techniques: FDMA, TDMA, CDMA, SDMA application in wire and wireless communication: Advantages (merits):

UNIT V SATELLITE, OPTICAL FIBER – POWERLINE, SCADA
Orbits: types of satellites: frequency used link establishment, MA techniques used in satellite communication, earth station; aperture actuators used in satellite – Intelsat and Insat: fibers – types: sources, detectors used, digital filters, optical link: power line carrier communications: SCADA
OUTCOMES:
- Ability to understand and analyse, linear and digital electronic circuits.

TEXT BOOKS:

REFERENCES:

EE6602 EMBEDDED SYSTEMS LT P C 3 0 0 3

OBJECTIVES:
- To introduce the Building Blocks of Embedded System
- To Educate in Various Embedded Development Strategies
- To Introduce Bus Communication in processors, Input/output interfacing.
- To impart knowledge in Various processor scheduling algorithms.
- To introduce Basics of Real time operating system and example tutorials to discuss on one real-time operating system tool

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS

UNIT II EMBEDDED NETWORKING

UNIT III EMBEDDED FIRMWARE DEVELOPMENT ENVIRONMENT
Embedded Product Development Life Cycle- objectives, different phases of EDLC, Modelling of EDLC; issues in Hardware-software Co-design, Data Flow Graph, state machine model, Sequential Program Model, concurrent Model, object oriented Model.

UNIT IV RTOS BASED EMBEDDED SYSTEM DESIGN
Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non-preemptive scheduling, Task communication-shared memory, message passing-, Inter process Communication – synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance, comparison of Real time Operating systems: Vx Works, μC/OS-II, RT Linux.
UNIT V  EMBEDDED SYSTEM APPLICATION DEVELOPMENT
Case Study of Washing Machine- Automotive Application- Smart card System Application,

OUTCOMES:
• Ability to understand and analyse, linear and digital electronic circuits.

TEXT BOOKS:

REFERENCES:

EI6611  INDUSTRIAL INSTRUMENTATION LABORATORY  L T P C
0 0 3 2

OBJECTIVES:
The aim of this lab is to impart an adequate knowledge and expertise to handle equipment generally available in an industry.

LIST OF EXPERIMENTS:
1. Discharge coefficient of orifice plate
2. Calibration of pressure gauge
3. Torque measurement
4. Viscosity measurement
5. Vacuum pressure measurement
6. Level measurement using d/p transmitter and capacitance based level measurement.
7. UV – Visible spectrophotometer
8. IR spectrophotometer
9. pH meter standardization and measurement of pH values of solutions
11. ECG measurement
12. Pulse rate measurement
13. One or two experiments beyond syllabus

A separate laboratory manual incorporating Aim, apparatus required, circuit Diagram, graph, Result for each experiment has to be developed by the Department and given to the students.

TOTAL : 45 PERIODS
OUTCOMES:
• Ability to understand and analyze Instrumentation systems and their applications to various industries.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

<table>
<thead>
<tr>
<th>Expt. No.</th>
<th>List of equipments</th>
<th>Quantity required for a batch of 30 students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Orifice plate</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>Dead weight tester with pressure gauge</td>
<td>1</td>
</tr>
<tr>
<td>3.</td>
<td>Torque trainer</td>
<td>1</td>
</tr>
<tr>
<td>4.</td>
<td>Saybolt Viscometer</td>
<td>1</td>
</tr>
<tr>
<td>5.</td>
<td>Vacuum gauge</td>
<td>1</td>
</tr>
<tr>
<td>6.</td>
<td>DP transmitter</td>
<td>1</td>
</tr>
<tr>
<td>7.</td>
<td>UV – Visible spectrophotometer</td>
<td>1</td>
</tr>
<tr>
<td>8.</td>
<td>IR spectrophotometer</td>
<td>1</td>
</tr>
<tr>
<td>9.</td>
<td>pH meter</td>
<td>1</td>
</tr>
<tr>
<td>10.</td>
<td>Conductivity meter</td>
<td>1</td>
</tr>
<tr>
<td>11.</td>
<td>ECG trainer</td>
<td>1</td>
</tr>
<tr>
<td>12.</td>
<td>Pulse rate trainer</td>
<td>1</td>
</tr>
</tbody>
</table>

EI6612 PROCESS CONTROL LABORATORY

OBJECTIVES:
To experimentally verify the process control concepts on the selected process control loops.

LIST OF EXPERIMENTS:

1. Study of Process Control Training Plant and Compact Flow Control Unit.
2. Characteristics of Pneumatically Actuated Control Valve (with and without Positioner).
3. Level Control and Pressure Control in Process Control Training Plant.
5. PID Implementation Issues.
6. Tuning of PID Controller for mathematically described processes
7. PID Enhancements (Cascade and Feed-forward Control Schemes)
8. Design and Implementation of Multi-loop PI Controller on the Three-tank system.
9. Analysis of Multi-input Multi-output system (Four-tank System).
10. Study of AC and DC drives.
11. Study of pH Control Test Rig.
OUTCOMES:
- Ability to understand and analyse process control engineering problems.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Study of Process control training plant and compact flow control unit.

**AIM**
To obtain the closed loop response of flow control loop for servo and regulator operation.

**EXERCISE**
1. Closed – loop connection is made in the flow process station.
2. The flow controller (P+I) is tuned using any one of the tuning techniques.
3. The response of the control loop is obtained for changes in the set point.
4. The response of the control loop is obtained for changes in the load variable.
5. The step 3 and 4 are repeated for different controller modes and settings.

**EQUIPMENT**
1. Flow process station with all accessories - 1 No
2. Analog / Digital PID controller - 1 No
3. Recorder - 1 No

2. Characteristics of pneumatically actuated control valve (with and without positioner)

**AIM**
To determine the flow – lift characteristics (Internet / Installed) of a control valve equipped with and without valve positioner.

**EXERCISE**
1. Plot the flow – lift characteristics of the given valve without positioner keeping
   (i) Constant ΔP
   (ii) Variable ΔP
2. Compute the valve gain at different operating points.
3. Plot the flow – lift characteristics of the given with positioner keeping.
   i. Constant ΔP
   ii. Variable ΔP
4. Compute the valve gain at different operating points.

**EQUIPMENT**
1. Control valve trainer (with position for varying ΔP across the valve) - 1 No
2. Flow meter - 1 No

3. Level control and pressure control in process control training plant

**AIM**
To obtain the closed loop response of level control loop for servo and regulator operation.
EXERCISE
1. Closed loop connection is made in the level process station.
2. The level controller (P+I) is tuned using any one of the tuning techniques.
3. The response of the control loop is obtained for changes in the set point.
4. The response of the control loop is obtained for changes in the load variable.
5. The step 3 and step 4 are repeated for different controller modes and settings.

EQUIPMENT
1. Level process station with all accessories - 1 No
2. Analog / Digital PID controller - 1 No
3. Recorder - 1 No
4. Design of ON/OFF controller for the temperature process

AIM
To obtain the ON/OFF response of temperature unit

EXERCISE
1. Open loop characteristic of temperature process.
2. Closed loop ON/OFF control of temperature process.

EQUIPMENT
1. Temperature process station with all accessories

5. PID implementation issues.

Equipment:
- Personal computer
- MATLAB software

6. Tuning of PID controller for mathematically described processes.

AIM
To study of various controller tuning

Equipment:
- Personal computer
- MATLAB software

7. PID enhancements (Cascade and Feed-forward control schemes)

AIM
To determine the closed loop performance of a cascade control system and compare it with that of conventional control system.

EXERCISE
1. The secondary and primary controllers are tuned using any one of the tuning techniques.
2. Obtain the closed loop response of cascade control system with the load variable entering the inner loop.
3. Obtain the closed loop regulating response with conventional control system.
4. Compare the performance of conventional control system and cascade control system internal of peak overshoot, setting time, I&E etc

**EQUIPMENT:**
1. Cascade control system with flow as inner variable and liquid level as outer variable with following accessories.  
2. Level transmitter - 1 No  
3. Flow transmitter - 1 No  
4. Control valve - 1 No  
5. Analog / Digital PID controller - 1 No  
6. Recorder - 1 No  
7. Matlab package

8. **Design and implementation of Multi-loop PI controller on the Three-tank system.**

**AIM**
To determine the closed loop performance of a multi-loop system

**EXERCISE**
1. Design of decentralized controller tuning  
2. Design of centralized controller tuning

**EQUIPMENT**
1. Three tank system with following accessories.  
2. Level transmitter - 3 No  
3. Pump control unit - 2 No  
4. Rota meter - 2 No  
5. Personal computer with ADC/DAC card - 1 No  
6. Matlab package

9. **Analysis of Multi-input Multi-output system (Four-Tank system)**

**AIM**
To determine the closed loop performance of a multi-loop system and

**EXERCISE**
1. Design of decentralized controller tuning  
2. Design of centralized controller tuning

**EQUIPMENT**
1. Four tank system with following accessories.  
2. Level transmitter - 4 No  
3. Pump control unit - 2 No  
4. Rota meter - 2 No  
5. Personal computer with ADC/DAC card - 1 No  
6. Matlab package

10. **Study of AC and DC drives.**

**AIM**
To determine the closed loop performance of AC and DC drives.
EXERCISE
1. Closed loop control of AC and DC motor.

EQUIPMENT
1. DC and DC motor.
2. Motor control unit for AC motor
3. Motor control unit for DC motor
4. Matlab package

11. Study of pH control test rig.

AIM
To determine the closed loop performance of a nonlinear system

EXERCISE
1. Open loop Characteristics study
2. Closed loop response

EQUIPMENT
1. pH control with following accessories.
2. pH transmitter - 1 No
3. Pump control unit - 2 No
4. Rota meter - 2 No
5. Personal computer with ADC/DAC card - 1 No
6. Matlab package


AIM
To study of various controller tuning

EQUIPMENT:
- Personal computer
- MATLAB software

EI6701 INDUSTRIAL DATA NETWORKS

OBJECTIVES:
- To educate on the basic concepts of data networks
- To introduce the basics of inter networking and serial communications
- To provide details on HART and Field buses
- To educate on MODBUS, PROFIBUS and other communication protocol
- To introduce industrial Ethernet and wireless communication

UNIT I DATA NETWORK FUNDAMENTALS
Networks hierarchy and switching – Open System Interconnection model of ISO - Data link control protocol - Media access protocol - Command / response - Token passing - CSMA/CD, TCP/IP
UNIT II  INTERNET WORKING and RS 232, RS 485 9
Bridges - Routers - Gateways - Standard ETHERNET and ARCNET configuration special requirement for networks used for control - RS 232, RS 485 configuration Actuator Sensor (AS) – interface, Devicenet

UNIT III  HART AND FIELDBUS 9

UNIT IV  MODBUS AND PROFIBUS PA/DP/FMS AND FF 9
MODBUS protocol structure - function codes – troubleshooting Profibus, Introduction, Profibus protocol stack, Profibus communication model - communication objects - system operation - troubleshooting - review of foundation fieldbus - Data Highway

UNIT V  INDUSTRIAL ETHERNET AND WIRELESS COMMUNICATION 9
Industrial Ethernet, Introduction, 10 Mbps Ethernet, 100 Mbps Ethernet - Radio and wireless communication, introduction, components of radio link - radio spectrum and frequency allocation - radio MODEMs-Introduction to wireless HART and ISA100.

TOTAL :45 PERIODS

OUTCOMES:
• Ability to understand and analyze Instrumentation systems and their applications to various industries.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To give an introductory knowledge on Programmable Logic Controller (PLC) and their programming languages
- To give adequate knowledge about applications of PLC
- To give basic knowledge about Computer Controlled Systems
- To give basic knowledge on the architecture and local control unit of Distributed Control System (DCS)
- To give adequate information with respect to interfaces used in DCS

UNIT I PROGRAMMABLE LOGIC CONTROLLER
Evolution of PLCs – Components of PLC – Architecture of PLC – Discrete and analog I/O modules – Programming languages - Ladder diagram – Function block diagram (FBD) - Programming timers and counters

UNIT II APPLICATIONS OF PLC
Instructions in PLC – Program control instructions, math instructions, data manipulation Instructions, sequencer and shift register instructions – Case studies in PLC

UNIT III COMPUTER CONTROLLED SYSTEMS
Basic building blocks of computer controlled systems – Data acquisition system – Supervisory control – Direct digital control - SCADA: Hardware and software, Remote terminal units, Master Station and Communication architectures.

UNIT IV DISTRIBUTED CONTROL SYSTEM
DCS – Various Architectures – Comparison – Local control unit – Process interfacing issues – Communication facilities

UNIT V INTERFACES IN DCS
Operator interfaces - Low level and high level operator interfaces – Displays - Engineering interfaces – Low level and high level engineering interfaces – Factors to be considered in selecting DCS – Case studies in DCS

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to understand and analyze Instrumentation systems and their applications to various industries.
- Ability to understand and analyse, linear and digital electronic circuits.

TEXT BOOKS:
REFERENCES:
1. T.A. Hughes, Programmable Controllers, Fourth edition, ISA press, 2005

EC6601 VLSI DESIGN LT P C 3 0 0 3

OBJECTIVES:
- In this course, the MOS circuit realization of the various building blocks that is common to any microprocessor or digital VLSI circuit is studied.
- Architectural choices and performance tradeoffs involved in designing and realizing the circuits in CMOS technology are discussed.
- The main focus in this course is on the transistor circuit level design and realization for digital operation and the issues involved as well as the topics covered are quite distinct from those encountered in courses on CMOS Analog IC design.

UNIT I MOS TRANSISTOR PRINCIPLE
NMOS and PMOS transistors, Process parameters for MOS and CMOS, Electrical properties of CMOS circuits and device modeling, Scaling principles and fundamental limits, CMOS inverter scaling, propagation delays, Stick diagram, Layout diagrams

UNIT II COMBINATIONAL LOGIC CIRCUITS
Examples of Combinational Logic Design, Elmore’s constant, Pass transistor Logic, Transmission gates, static and dynamic CMOS design, Power dissipation – Low power design principles

UNIT III SEQUENTIAL LOGIC CIRCUITS
Static and Dynamic Latches and Registers, Timing issues, pipelines, clock strategies, Memory architecture and memory control circuits, Low power memory circuits, Synchronous and Asynchronous design

UNIT IV DESIGNING ARITHMETIC BUILDING BLOCKS
Data path circuits, Architectures for ripple carry adders, carry look ahead adders, High speed adders, accumulators, Multipliers, dividers, Barrel shifters, speed and area tradeoff

UNIT V IMPLEMENTATION STRATEGIES
Full custom and Semi custom design, Standard cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures.

TOTAL: 45 PERIODS
OUTCOMES:
Upon completion of the course, students should
- Explain the basic CMOS circuits and the CMOS process technology.
- Discuss the techniques of chip design using programmable devices.
- Model the digital system using Hardware Description Language.

TEXTBOOKS:

REFERENCES:

EI6703 FIBRE OPTICS AND LASER INSTRUMENTS      L T P C
  3 0 0 3

OBJECTIVES:
- To expose the basic concepts of optical fibers and their industrial applications.
- To provide adequate knowledge about Industrial application of optical fibres.
- To provide basic concepts of lasers.
- To provide knowledge about Industrial application of lasers
- To provide knowledge about Industrial application of Holography and Medical applications of Lasers.

UNIT I OPTICAL FIBRES AND THEIR PROPERTIES 9

UNIT II INDUSTRIAL APPLICATION OF OPTICAL FIBRES 9

UNIT III LASER FUNDAMENTALS 9
UNIT IV  INDUSTRIAL APPLICATION OF LASERS  9
Laser for measurement of distance, length, velocity, acceleration, current, voltage and Atmospheric effect – Material processing – Laser heating, welding, melting and trimming of material – Removal and vaporization.

UNIT V  HOLOGRAM AND MEDICAL APPLICATIONS  9

OUTCOMES:
• Ability to understand and analyze Instrumentation systems and their applications to various industries.

TEXT BOOKS:

REFERENCES:
1. Asu Ram Jha, Fiber Optic Technology Applications to commercial, Industrial, Military and Space Optical systems, PHI learning Private limited, 2009.

EI6704  BIOMEDICAL INSTRUMENTATION  L T P C
3 0 0 3

OBJECTIVES:
• To Introduce Fundamentals of Biomedical Engineering
• To study the communication mechanics in a biomedical system with few examples
• To study measurement of certain important electrical and non-electrical parameters
• To understand the basic principles in imaging techniques
• To have a basic knowledge in life assisting and therapeutic devices

UNIT I  FUNDAMENTALS OF BIOMEDICAL ENGINEERING  9

UNIT II  NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC PROCEDURES  9
Measurement of blood pressure - Cardiac output - Heart rate - Heart sound - Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – Blood Gas

UNIT III ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS
9

UNIT IV IMAGING MODALITIES AND ANALYSIS
9

UNIT V LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES
9

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to understand and analyze Instrumentation systems and their applications to various industries.

TEXT BOOKS:

REFERENCES:
OBJECTIVES
- To learn Hardware Descriptive Language (Verilog/VHDL)
- To learn the fundamental principles of VLSI circuit design in digital and analog domain
- To familiarise fusing of logical modules on FPGAs
- To provide hands on design experience with professional design (EDA) platforms.

LIST OF EXPERIMENTS

FPGA BASED EXPERIMENTS.
1. HDL based design entry and simulation of simple counters, state machines, adders (min 8 bit) and multipliers (4 bit min).
2. Synthesis, P&R and post P&R simulation of the components simulated in (1) above. Critical paths and static timing analysis results to be identified. Identify and verify possible conditions under which the blocks will fail to work correctly.
3. Hardware fusing and testing of each of the blocks simulated in (1). Use of either chipscope feature (Xilinx) or the signal tap feature (Altera) is a must. Invoke the PLL and demonstrate the use of the PLL module for clock generation in FPGAs.

IC DESIGN EXPERIMENTS: (BASED ON CADENCE / MENTOR GRAPHICS / EQUIVALENT)
4. Design and simulation of a simple 5 transistor differential amplifier. Measure gain, ICMR, and CMRR
5. Layout generation, parasitic extraction and resimulation of the circuit designed in (1)
7. For expt (c) above, P&R, power and clock routing, and post P&R simulation.
8. Analysis of results of static timing analysis.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to
- Write HDL code for basic as well as advanced digital integrated circuits.
- Import the logic modules into FPGA Boards.
- Synthesize, Place and Route the digital IPs.
- Design, Simulate and Extract the layouts of Analog IC Blocks using EDA tools.

LAB EQUIPMENTS FOR A BATCH OF 30 STUDENTS:
Xilinx or Altera FPGA 10 nos
Xilinx software
Cadence/MAGMA/Tanner or equivalent software package 10 User License
PCs 10 No.s
OBJECTIVES:
To obtain adequate knowledge in design of various signal conditioning circuits, instrumentation systems, controller and control valve.

LIST OF EXPERIMENTS:

1. Design of Instrumentation amplifier.
2. Design of active filters – LPF, HPF and BPF
3. Design of regulated power supply and design of V/I and I/V converters.
5. Design of signal conditioning circuit for strain gauge and RTD.
6. Design of orifice plate and rotameter.
7. Design of Control valve (sizing and flow-lift characteristics)
8. Design of PID controller (using operational amplifier and microprocessor)
9. Design of a multi-channel data acquisition system
10. Design of multi range DP transmitter
12. Preparation of documentation of instrumentation project and project scheduling for the above case study. (process flow sheet, instrument index sheet and instrument specifications sheet, job scheduling, installation procedures and safety regulations).
13. Programmable Logic Controller – Case study.
14. One or two experiments beyond syllabus

A separate laboratory manual incorporating Aim, apparatus required, circuit Diagram, graph, Result for each experiment has to be developed by the Department and given to the students

TOTAL : 45 PERIODS

OUTCOMES:
- Ability to understand and analyze Instrumentation systems and their applications to various industries.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

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<tr>
<th>Expt.No.</th>
<th>List of equipments</th>
<th>Quantity required for a batch of 30 students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Monolithic Instrumentation amplifier Operational amplifiers</td>
<td>2 Nos</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 Nos.</td>
</tr>
<tr>
<td>2</td>
<td>Operational amplifiers</td>
<td>3 Nos.</td>
</tr>
<tr>
<td>3</td>
<td>IC 7805 and resistors, diodes, capacitors Operational amplifier &amp; Loop analyzer</td>
<td>1 No.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 No.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 No.</td>
</tr>
<tr>
<td>4</td>
<td>Thermocouple &amp; RTD Opamp</td>
<td>1 No. each</td>
</tr>
<tr>
<td>5</td>
<td>Bonded strain gauge, Loads, Opamp</td>
<td>1 No. each</td>
</tr>
</tbody>
</table>
### EI6712  COMPREHENSION  

**OBJECTIVES:**
To encourage the students to comprehend the knowledge acquired from the first Semester to Sixth Semester of B.E Degree Course through periodic exercise.

**METHOD OF EVALUATION:**
The students will be assessed 100% internally through weekly test with objective type questions on all the subject related topics

**OUTCOMES:**
- Ability to review, prepare and present technological developments

### MG6851  PRINCIPLES OF MANAGEMENT  

**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**
Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations, system and contingency approaches – Types of Business organization - Sole proprietorship, partnership,
company-public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.

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

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To introduce analysis of discrete time systems in state variable form
- To introduce system identification techniques
- To educate on direct discrete design techniques
- To introduce multi-loop regulatory control
- To introduce multivariable regulatory control

UNIT I  DISCRETE STATE-VARIABLE TECHNIQUE  9

UNIT II  SYSTEM IDENTIFICATION  9

UNIT III  DIGITAL CONTROLLER DESIGN  9

UNIT IV  MULTI-LOOP REGULATORY CONTROL  9

UNIT V  MULTIVARIABLE REGULATORY CONTROL  9

TOTAL: 45 PERIODS

OUTCOMES:

- To understand and apply computing platform and software for engineering problems.

TEXT BOOKS:

REFERENCES:
1. Stephanopoulos, G., “Chemical Process Control -An Introduction to Theory and
EI6811 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.

CS6659 ARTIFICIAL INTELLIGENCE

OBJECTIVES:
The student should be made to:
- Study the concepts of Artificial Intelligence.
- Learn the methods of solving problems using Artificial Intelligence.
- Introduce the concepts of Expert Systems and machine learning.

UNIT I INTRODUCTION TO AI AND PRODUCTION SYSTEMS
Introduction to AI-Problem formulation, Problem Definition -Production systems, Control strategies, Search strategies. Problem characteristics, Production system characteristics -Specialized production
system- Problem solving methods - Problem graphs, Matching, Indexing and Heuristic functions -Hill Climbing-Depth first and Breath first, Constraints satisfaction - Related algorithms, Measure of performance and analysis of search algorithms.

UNIT II REPRESENTATION OF KNOWLEDGE 9
Game playing - Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic-Structured representation of knowledge.

UNIT III KNOWLEDGE INFERENCE 9
Knowledge representation -Production based system, Frame based system. Inference - Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian Theory-Bayesian Network-Dempster - Shafer theory.

UNIT IV PLANNING AND MACHINE LEARNING 9

UNIT V EXPERT SYSTEMS 9

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Identify problems that are amenable to solution by AI methods.
- Identify appropriate AI methods to solve a given problem.
- Formalise a given problem in the language/framework of different AI methods.
- Implement basic AI algorithms.
- Design and carry out an empirical evaluation of different algorithms on a problem formalisation, and state the conclusions that the evaluation supports.

TEXT BOOKS:

REFERENCES:
4. http://nptel.ac.in
OBJECTIVES:
- To make students understand the basic structure and operation of digital computer.
- To understand the hardware-software interface.
- To familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations.
- To expose the students to the concept of pipelining.
- To familiarize the students with hierarchical memory system including cache memories and virtual memory.
- To expose the students with different ways of communicating with I/O devices and standard I/O interfaces.

UNIT I OVERVIEW & INSTRUCTIONS

UNIT II ARITHMETIC OPERATIONS
ALU - Addition and subtraction – Multiplication – Division – Floating Point operations – Subword parallelism.

UNIT III PROCESSOR AND CONTROL UNIT
Basic MIPS implementation – Building datapath – Control Implementation scheme – Pipelining – Pipelined datapath and control – Handling Data hazards & Control hazards – Exceptions.

UNIT IV PARALLELISM
Instruction-level-parallelism – Parallel processing challenges – Flynn’s classification – Hardware multithreading – Multicore processors

UNIT V MEMORY AND I/O SYSTEMS
Memory hierarchy - Memory technologies – Cache basics – Measuring and improving cache performance - Virtual memory, TLBs - Input/output system, programmed I/O, DMA and interrupts, I/O processors.

OUTCOMES:
At the end of the course, the student should be able to:
- Design arithmetic and logic unit.
- Design and analyse pipelined control units
- Evaluate performance of memory systems.
- Understand parallel processing architectures.

TEXT BOOK:

REFERENCES:
OBJECTIVES:
The student should be made to:
- Study the basic concepts and functions of operating systems
- Understand the structure and functions of OS
- Learn about Processes, Threads and Scheduling algorithms
- Understand the principles of concurrency and Deadlocks
- Learn various memory management schemes
- Study I/O management and File systems
- Learn the basics of Linux system and perform administrative tasks on Linux Servers

UNIT I  OPERATING SYSTEMS OVERVIEW

UNIT II  PROCESS MANAGEMENT

UNIT III  STORAGE MANAGEMENT
Main Memory-Contiguous Memory Allocation, Segmentation, Paging, 32 and 64 bit architecture Examples; Virtual Memory- Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory, OS Examples.

UNIT IV  I/O SYSTEMS

UNIT V  CASE STUDY
Linux System- Basic Concepts; System Administration- Requirements for Linux System Administrator, Setting up a LINUX Multifunction Server, Domain Name System, Setting Up Local Network Services; Virtualization- Basic Concepts, Setting Up Xen, VMware on Linux Host and Adding Guest OS.
OUTCOMES:
At the end of the course, the student should be able to:
- Design various Scheduling algorithms
- Apply the principles of concurrency
- Design deadlock, prevention and avoidance algorithms.
- Compare and contrast various memory management schemes
- Design and implement a prototype file systems
- Perform administrative tasks on Linux Servers

TEXT BOOK:

REFERENCES:
5. http://nptel.ac.in/
UNIT IV   ALGORITHM DESIGN TECHNIQUES
The role of algorithms in computing - Getting Started - Growth of functions. Divide and conquer-
dynamic programming - Greedy Algorithm – Backtracking.

UNIT V   GRAPHS ALGORITHMS
Elementary Graph Algorithms - Minimum Spanning Trees - Single-source shortest paths - All pairs
shortest paths.

OUTCOMES:
- To understand and apply computing platform and software for engineering problems.

TEXT BOOKS:
3. Thomas H Cormen, Charles E Leiserson and Ronald L Rivest,” Introduction to

REFERENCES:
1. R G Dromey,”How to solve it by computers”, Pearson Education Asia, 2005.
2. Robert L Kruse, Clovis L Tando and Bruce P Leung,”Data structures and Program
   Learning, 2012.
5. Jean Paul Trembley, Paul G Sorenson, “An Introduction to Data Structures with
UNIT II MEASUREMENTS IN POWER PLANTS

UNIT III BOILER CONTROL – I

UNIT IV BOILER CONTROL – II

UNIT V CONTROL OF TURBINE
Types of steam turbines – impulse and reaction turbines – Compounding – Turbine governing system – Speed and Load control – Transient speed rise – Free governor mode operation – Automatic Load Frequency Control – Turbine oil system – Oil pressure drop relay – Oil cooling system – Turbine run up system.

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to understand and analyze Instrumentation systems and their applications to various industries

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
To provide sound knowledge about
- To introduce the methods of crude oil extraction, processing and refining
- To educate on Unit operations in petroleum refinery and petrochemical industry
- To introduce Production routes of important petrochemicals, and
- To provide knowledge on Control of selected petrochemicals production processes.
- To educate on the safety in instrumentation systems

UNIT I OIL EXTRACTION AND PROCESSING 9
Techniques used for oil discovery - seismic survey - methods of oil extraction - oil rig system - Primary and Secondary recovery - Enhanced oil recovery - separation of gas and water from oil - control loops in oil gas separator - scrubber - coalescer

UNIT II PETROLEUM REFINING 9
Petroleum refining process - unit operations in refinery - thermal cracking - catalytic cracking - catalytic reforming - polymerization - isomerization - alkylation - Production of ethylene, acetylene and propylene from petroleum

UNIT III CHEMICALS FROM PETROLEUM 9
Chemicals from methane, acetylene, ethylene and propylene - production routes of important petrochemicals such as polyethylene, polypropylene, ethylene dioxide, methanol, xylene, benzene, toluene, styrene, VCM and PVC

UNIT IV CONTROL LOOPS IN PETROCHEMICAL INDUSTRY 9
Control of binary and fractional distillation columns - Control of catalytic and thermal crackers - control of catalytic reformer - control of alkylation process - Control of polyethylene production – Control of VCM and PVC production

UNIT V SAFETY IN INSTRUMENTATION SYSTEMS 9
Area and material classification as per National Electric Code (NEC) - Classification as per International Electro technical Commission (IEC) - Techniques used to reduce explosion hazards - Pressurization techniques - Type X, Type Y and Type Z - Intrinsic safety - Mechanical and Electrical isolation - Lower and Upper explosion limit

TOTAL : 45 PERIODS

OUTCOMES:
- Ability to understand and analyze Instrumentation systems and their applications to various industries

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
The student should be made to:
- Learn digital image fundamentals.
- Be exposed to simple image processing techniques.
- Be familiar with image compression and segmentation techniques.
- Learn to represent image in form of features.

UNIT I   DIGITAL IMAGE FUNDAMENTALS

UNIT II   IMAGE ENHANCEMENT

UNIT III   IMAGE RESTORATION AND SEGMENTATION

UNIT IV   WAVELETS AND IMAGE COMPRESSION

UNIT V   IMAGE REPRESENTATION AND RECOGNITION

OUTCOMES:
Upon successful completion of this course, students will be able to:
- Discuss digital image fundamentals.
- Apply image enhancement and restoration techniques.
- Use image compression and segmentation Techniques.
- Represent features of images.

TEXT BOOK:
IC6601 ADVANCED CONTROL SYSTEM

OBJECTIVES:
- To provide knowledge on design in state variable form
- To provide knowledge in phase plane analysis.
- To give basic knowledge in describing function analysis.
- To study the design of optimal controller.
- To study the design of optimal estimator including Kalman Filter

UNIT I STATE VARIABLE DESIGN
Introduction to state Model- effect of state Feedback- Necessary and Sufficient Condition for Arbitrary Pole-placement- pole placement Design- design of state Observers- separation principle- servo design: -State Feedback with integral control

UNIT II PHASE PLANE ANALYSIS

UNIT III DESCRIBING FUNCTION ANALYSIS

UNIT IV OPTIMAL CONTROL
Introduction - Time varying optimal control – LQR steady state optimal control – Solution of Ricatti’s equation – Application examples.

UNIT V OPTIMAL ESTIMATION
Optimal estimation – Kalman Bucy Filter-Solution by duality principle-Discrete systems-Kalman Filter-Application examples..

TOTAL : 45 PERIODS

OUTCOMES:
- Ability to apply advanced control theory to practical engineering problems.
TEXT BOOKS:

REFERENCES:

EE6003 OPTIMISATION TECHNIQUES L T P C
3 0 0 3

OBJECTIVES:
- To introduce the basic concepts of linear programming
- To educate on the advancements in Linear programming techniques
- To introduce non-linear programming techniques
- To introduce the interior point methods of solving problems
- To introduce the dynamic programming method

UNIT I LINEAR PROGRAMMING
Introduction - formulation of linear programming model-Graphical solution–solving LPP using simplex algorithm – Revised Simplex Method

UNIT II ADVANCES IN LPP
Dualit theory- Dual simplex method - Sensitivity analysis—Transportation problems– Assignment problems-Traveling sales man problem -Data Envelopment Analysis

UNIT III NON LINEAR PROGRAMMING
Classification of Non Linear programming – Lagrange multiplier method – Karush – Kuhn Tucker conditions–Reduced gradient algorithms–Quadratic programming method – Penalty and Barrier method.

UNIT IV INTERIOR POINT METHODS

UNIT V DYNAMIC PROGRAMMING
Formulation of Multi stage decision problem–Characteristics–Concept of sub-optimization and the

OUTCOMES:

- To understand ethical issues, environmental impact and acquire management skills.

TEXT BOOKS:


REFERENCES:

   New Delhi, 2005.

EE6007 MICRO ELECTRO MECHANICAL SYSTEMS  L T P C  3 0 0 3

OBJECTIVES:

- To provide knowledge of semiconductors and solid mechanics to fabricate MEMS devices.
- To educate on the rudiments of Micro fabrication techniques.
- To introduce various sensors and actuators
- To introduce different materials used for MEMS
- To educate on the applications of MEMS to disciplines beyond Electrical and Mechanical engineering.

UNIT I INTRODUCTION  9

UNIT II SENSORS AND ACTUATORS-I  9

UNIT III SENSORS AND ACTUATORS-II  9
UNIT IV  MICROMACHINING  9
Silicon Anisotropic Etching – Anisotropic Wet Etching – Dry Etching of Silicon – Plasma Etching –
Deep Reaction Ion Etching (DRIE) – Isotropic Wet Etching – Gas Phase Etchants – Case studies -
Basic surface micro machining processes – Structural and Sacrificial Materials – Acceleration of
sacrificial Etch – Striction and Antistriction methods – LIGA Process - Assembly of 3D MEMS –
Foundry process.

UNIT V  POLYMER AND OPTICAL MEMS  9
Polymers in MEMS– Polimide - SU-8 - Liquid Crystal Polymer (LCP) – PDMS – PMMA – Parylene –
Fluorocarbon - Application to Acceleration, Pressure, Flow and Tactile sensors- Optical MEMS –
Lenses and Mirrors – Actuators for Active Optical MEMS.

TOTAL : 45 PERIODS

OUTCOMES:

• Ability to understand the operation of micro devices, micro systems and their applications.
• Ability to design the micro devices, micro systems using the MEMS fabrication process.

TEXT BOOKS:

REFERENCES:

EE6008  MICROCONTROLLER BASED SYSTEM DESIGN  L T P C
3 0 0 3

OBJECTIVES:
• To introduce the architecture of PIC microcontroller
• To educate on use of interrupts and timers
• To educate on the peripheral devices for data communication and transfer
• To introduce the functional blocks of ARM processor
• To educate on the architecture of ARM processors

UNIT I  INTRODUCTION TO PIC MICROCONTROLLER  9
Introduction to PIC Microcontroller–PIC 16C6x and PIC16C7x Architecture–PIC16cxx— Pipelining -
UNIT II  INTERRUPTS AND TIMER  

UNIT III  PERIPHERALS AND INTERFACING  

UNIT IV  INTRODUCTION TO ARM PROCESSOR  

UNIT V  ARM ORGANIZATION  
3-Stage Pipeline ARM Organization— 5-Stage Pipeline ARM Organization—ARM Instruction Execution- ARM Implementation— ARM Instruction Set— ARM coprocessor interface— Architectural support for High Level Languages – Embedded ARM Applications.

OUTCOMES:

- To understand and apply computing platform and software for engineering problems.
- To understand ethical issues, environmental impact and acquire management skills.

TEXT BOOKS:

REFERENCE:

EE6006  APPLIED SOFT COMPUTING  
L T P C 3 0 0 3

OBJECTIVES:

- To expose the students to the concepts of feed forward neural networks.
- To provide adequate knowledge about feedback neural networks
- To provide adequate knowledge about fuzzy and neuro-fuzzy systems
- To provide comprehensive knowledge of fuzzy logic control to real time systems.
- To provide adequate knowledge of genetic algorithms and its application to economic dispatch and unit commitment problems.

UNIT I  ARCHITECTURES – ANN
UNIT II  NEURAL NETWORKS FOR CONTROL  9

UNIT III  FUZZY SYSTEMS  9

UNIT IV  APPLICATION OF FUZZY LOGIC SYSTEMS  9
Fuzzy logic control: Home heating system - liquid level control - aircraft landing- inverted pendulum – fuzzy PID control, Fuzzy based motor control.

UNIT V  GENETIC ALGORITHMS  9

TOTAL: 45 PERIODS

OUTCOMES:

• Ability to understand and apply basic science, circuit theory, Electro-magnetic field theory control theory and apply them to electrical engineering problems.
• To understand and apply computing platform and software for engineering problems.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To introduce the components of digital control system
- To provide knowledge on pulse transfer functions and their analysis
- To introduce stability concepts in discrete domain
- To educate on tuning of PID controllers in discrete domain
- To introduce state variable analysis in discrete domain

UNIT I INTRODUCTION

UNIT II PULSE TRANSFER FUNCTION AND TIME RESPONSE

UNIT III STABILITY

UNIT IV DIGITAL PID CONTROLLER

UNIT V STATE SPACE ANALYSIS
Realisation of Pulse Transfer Function- Diagonalisation- discretisation of Continuous time systems- State Transition Matrix- Solution of Discrete-time state equations- Controllability and Observability

TOTAL : 45 PERIODS

OUTCOMES:
- Ability to apply advanced control theory to practical engineering problems.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
To learn about basis of nanomaterial science, preparation method, types and application

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

UNIT II GENERAL METHODS OF PREPARATION
Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III NANOMATERIALS
Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications- Nanometal oxides-ZnO, TiO2,MgO, ZrO2, NiO, nanoalumina, CaO, AgTiO2, Ferrites, Nanoclays-functionalization and applications-Quantum wires, Quantum dots-preparation, properties and applications

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

UNIT V APPLICATIONS

OUTCOMES:
• Will familiarize about the science of nanomaterials
• Will demonstrate the preparation of nanomaterials
• Will develop knowledge in characteristic nanomaterial

TEXT BOOKS:

REFERENCES
OBJECTIVES:
- To introduce Non parametric methods
- To impart knowledge on parameter estimation methods
- To impart knowledge on Recursive identification methods
- To impart knowledge on Adaptive control schemes
- To introduce stability, Robustness and Applications of adaptive control method

UNIT I NON PARAMETRIC METHODS
Non parametric methods: Transient analysis–frequency analysis–Correlation analysis–Spectral analysis.

UNIT II PARAMETER ESTIMATION METHODS

UNIT III RECURSIVE IDENTIFICATION METHODS

UNIT IV ADAPTIVE CONTROL SCHEMES

UNIT V ISSUES IN ADAPTIVE CONTROL AND APPLICATIONS
Stability – Convergence – Robustness –Applications of adaptive control.

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to apply advanced control theory to practical engineering problems.

TEXT BOOKS:

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

UNIT I INTRODUCTION

UNIT II TQM PRINCIPLES
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
The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT IV TQM TOOLS AND TECHNIQUES II

UNIT V QUALITY SYSTEMS

TOTAL: 45 PERIODS

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

TEXT BOOK:

REFERENCES:
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

UNIT II ENGINEERING ETHICS

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS

UNIT V GLOBAL ISSUES

TOTAL: 45 PERIODS

OUTCOMES:
- 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.

TEXT BOOKS:

REFERENCES:
IC6003 PRINCIPLES OF ROBOTICS

OBJECTIVES:
- To introduce the functional elements of Robotics
- To impart knowledge on the direct and inverse kinematics
- To introduce the manipulator differential motion and control
- To educate on various path planning techniques
- To introduce the dynamics and control of manipulators

UNIT I BASIC CONCEPTS

UNIT II DIRECT AND INVERSE KINEMATICS

UNIT III MANIPULATOR DIFFERENTIAL MOTION AND STATICS
Linear and angular velocities-Manipulator Jacobian-Prismatic and rotary joints–Inverse -Wrist and arm singularity - Static analysis - Force and moment Balance.

UNIT IV PATH PLANNING
Definition-Joint space technique-Use of p-degree polynomial-Cubic polynomial-Cartesian space technique - Parametric descriptions - Straight line and circular paths - Position and orientation planning.

UNIT V DYNAMICS AND CONTROL
Lagrangian mechanics-2DOF Manipulator-Lagrange Euler formulation-Dynamic model -Manipulator control problem-Linear control schemes-PID control scheme-Force control of robotic manipulator.

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to understand and analyze Instrumentation systems and their applications to various industries.

TEXT BOOKS:
REFERENCES:

EC6002 ADVANCED DIGITAL SIGNAL PROCESSING L T P C
3 0 0 3

OBJECTIVES:
• To bring out the concepts related to stationary and non-stationary random signals
• To emphasize the importance of true estimation of power spectral density
• To introduce the design of linear and adaptive systems for filtering and linear prediction
• To introduce the concept of wavelet transforms in the context of image processing

UNIT I DISCRETE-TIME RANDOM SIGNALS 9

UNIT II SPECTRUM ESTIMATION 9
Bias and Consistency, Periodogram, Modified periodogram, Blackman-Tukey method, Welch method, Parametric methods of spectral estimation, Levinson-Durbin recursion.

UNIT III LINEAR ESTIMATION AND PREDICTION 9
Forward and Backward linear prediction, Filtering - FIR Wiener filter- Filtering and linear prediction, non-causal and causal IIR Wiener filters, Discrete Kalman filter.

UNIT IV ADAPTIVE FILTERS 9

UNIT V WAVELET TRANSFORM 9
Multiresolution analysis, Continuous and discrete wavelet transform, Short Time Fourier Transform, Application of wavelet transform, Cepstrum and Homomorphic filtering.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, students will be able to:
• Explain the parametric methods for power spectrum estimation.
• Discuss adaptive filtering techniques using LMS algorithm and the applications of adaptive filtering.
• Analyze the wavelet transforms.

**TEXT BOOKS:**

**REFERENCE:**
AFFILIATED INSTITUTIONS

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

R – 2013

PROGRAM EDUCATIONAL OBJECTIVES:

1. To prepare the students have successful career in industry and motivate for higher education.
2. To provide strong foundation in basic science and mathematics necessary to formulate, solve and analyze electrical and electronics problems.
3. To provide strong foundation in circuit theory, field theory, control theory and signal processing concepts.
4. To provide good knowledge of Electrical power apparatus and their applications in power systems.
5. To provide knowledge on basic electronics to power electronics and their applications in power engineering.
6. To provide an opportunity to work in interdisciplinary groups.
7. To promote student awareness for life long learning and inculcate professional ethics.
8. To provide necessary foundation on computational platforms and software applications related to the respective field of engineering.

PROGRAM OUTCOMES:

a) Ability to understand and apply differential equations, integrals, matrix theory, probability theory and Laplace, Fourier and Z transformations for engineering problems.
b) Ability to understand and apply basic science, circuit theory, Electromagnetic field theory control theory and apply them to electrical engineering problems.
c) Ability to model and analyze electrical apparatus and their application to power systems.
d) Ability to understand and analyze power system operation, stability, control and protection.
e) Ability to handle the engineering aspects of electrical energy generation and utilization.
f) Ability to understand and analyse, linear and digital electronic circuits.
g) Ability to review, prepare and present technological developments.
h) Ability to form a group and develop or solve engineering hardware and problems.
i) To understand and apply computing platform and software for engineering problems.
j) To understand ethical issues, environmental impact and acquire management skills.

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# Semester 1

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**ELECTIVE - IV**

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**ELECTIVE – V**

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<td>VLSI Design</td>
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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

9+3

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

9+3

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

9+3

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

9+3

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

- Project
- Assignment
- Reviews
- Creative writing
- Poster making, etc.

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

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

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.

TEXT BOOKS:

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

UNIT I CRYSTAL PHYSICS
Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, 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
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

UNIT III QUANTUM PHYSICS

UNIT IV ACOUSTICS AND ULTRASONICS
Production of ultrasonics 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.

TOTAL: 45 PERIODS

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.

TEXT BOOKS:
1. Arumugam M. Engineering Physics. Anuradha publishers, 2010
REFERENCES:
1. Searls and Zemansky. University Physics, 2009
5. Rajagopal K. Engineering Physics. PHI, New Delhi, 2011

CY6151 ENGINEERING CHEMISTRY - I

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 polydispersity 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 isochore (problems).

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY


UNIT IV PHASE RULE AND ALLOYS

Phase rule: Introduction, definition of terms with examples, One Component System- water system - Reduced phase rule - Two Component Systems- classification – lead-silver system, zinc-magnesium system. Alloys: Introduction- Definition- Properties of alloys- Significance of alloying,

UNIT V   NANOCHEMISTRY
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

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.

TEXT BOOKS:

REFERENCES:

GE6151   COMPUTER PROGRAMMING
L T P C
3 0 0 3

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) 1
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  PLANES CURVES AND FREE HAND SKETCHING 5+9
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 5+9
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 5+9
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 5+9
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 6+9
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) 3
Introduction to drafting packages and demonstration of their use.

TOTAL : 75 PERIODS
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.

TEXT BOOK:

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.
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:
1. Search, generate, manipulate data using MS office/Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions – Includes Parameter Passing
9. Program using Recursive Function and conversion from given program to flow chart.
10. 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.
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.
GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE 10
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 13
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.
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

### 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, porcelain tile, dropper (each 30 Nos.)

HS6251 TECHNICAL ENGLISH II

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
9+3
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.

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

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%
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 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 parallelepipeds.

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 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, z², 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.

TEXT BOOKS:


REFERENCES:

PH6251 ENGINEERING PHYSICS – II L T P C
3 0 0 3

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
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
UNIT V  ADVANCED ENGINEERING MATERIALS


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.

TEXT BOOKS:

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

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 – refactoriness 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

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.

TEXT BOOKS:

REFERENCES:
OBJECTIVES

- To impart basic knowledge on Civil and Mechanical Engineering.
- To explain the materials used for the construction of civilized structures.
- To make the understand the fundamentals of construction of structure.
- To explain the component of power plant units and detailed explanation to IC engines their working principles.
- To explain the R & AC system.

A – CIVIL ENGINEERING

UNIT I  SURVEYING AND CIVIL ENGINEERING MATERIALS  15


UNIT II  BUILDING COMPONENTS AND STRUCTURES  15
Foundations: Types, Bearing capacity – Requirement of good foundations.

TOTAL: 30 PERIODS

B – MECHANICAL ENGINEERING

UNIT III  POWER PLANT ENGINEERING  10

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

UNIT V  REFRIGERATION AND AIR CONDITIONING SYSTEM  10

TOTAL: 30 PERIODS

OUTCOMES:

- Ability to explain the usage of construction material and proper selection of construction materials.
- Ability to design building structures.
- Ability to identify the components use in power plant cycle.
- Ability to demonstrate working principles of petrol and diesel engine.
- Ability to explain the components of refrigeration and Air conditioning cycle.
TEXT BOOKS:

REFERENCES:

EE6201 CIRCUIT THEORY
L T P C
3 1 0 4

OBJECTIVES:
• To introduce electric circuits and its analysis
• To impart knowledge on solving circuits using network theorems
• To introduce the phenomenon of resonance in coupled circuits.
• To educate on obtaining the transient response of circuits.
• To Phasor diagrams and analysis of three phase circuits

UNIT I BASIC CIRCUITS ANALYSIS

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

UNIT III RESONANCE AND COUPLED CIRCUITS

UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS
Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input – Characterization of two port networks in terms of Z,Y and h parameters.

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

TOTAL : 60 PERIODS
OUTCOMES:
- Ability analyse electrical circuits
- Ability to apply circuit theorems
- Ability to analyse AC and DC Circuits

TEXT BOOKS:

REFERENCES:

GE6262 PHYSICS AND CHEMISTRY LABORATORY – II

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 BaCl$_2$ and Na$_2$SO$_4$

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)
OBJECTIVES:
The Students should be made to
- Be exposed to Unix shell commands
- Be familiar with an editor on Unix
- Learn to program in Shell script
- Learn to write C programme for Unix platform

LIST OF EXPERIMENTS

1. UNIX COMMANDS  
Study of Unix OS - Basic Shell Commands - Unix Editor  
15

2. SHELL PROGRAMMING  
Simple Shell program - Conditional Statements - Testing and Loops  
15

3. C PROGRAMMING ON UNIX  
Dynamic Storage Allocation-Pointers-Functions-File Handling  
15

OUTCOMES:  
At the end of the course the students should be able to:
- Use Shell commands
- Design of Implement Unix shell scripts
- Write and execute C programs on Unix

HARDWARE / SOFTWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS

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

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

- To provide practical experience with simulation of electrical circuits and verifying circuit theorems.

LIST OF EXPERIMENTS

1. Experimental verification of Kirchhoff’s voltage and current laws
2. Experimental verification of network theorems (Thevenin, Norton, Superposition and maximum power transfer Theorem).
3. Study of CRO and measurement of sinusoidal voltage, frequency and power factor.
4. Experimental determination of time constant of series R-C electric circuits.
5. Experimental determination of frequency response of RLC circuits.
6. Design and Simulation of series resonance circuit.
7. Design and Simulation of parallel resonant circuits.
8. Simulation of low pass and high pass passive filters.
9. Simulation of three phase balanced and unbalanced star, delta networks circuits.
10. Experimental determination of power in three phase circuits by two-watt meter method.
11. Calibration of single phase energy meter.
12. Determination of two port network parameters.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to understand and apply circuit theorems and concepts in engineering applications.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

2. Function Generator (1 MHz) - 10 Nos.
4. Oscilloscope (20 MHz) - 10 Nos.
5. Digital Storage Oscilloscope (20 MHz) – 1 No.
6. Circuit Simulation Software (5 Users) (Pspice / Matlab /other Equivalent software Package) with PC (5 Nos.) and Printer (1 No.)
7. AC/DC - Voltmeters (10 Nos.), Ammeters (10 Nos.) and Multi-meters (10 Nos.)
9. Decade Resistance Box, Decade Inductance Box, Decade Capacitance Box Each - 6 Nos.
10. Circuit Connection Boards - 10 Nos.

Necessary Quantities of Resistors, Inductors, Capacitors of various capacities (Quarter Watt to 10 Watt)
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 9+3

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

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:

<table>
<thead>
<tr>
<th>EE6301</th>
<th>DIGITAL LOGIC CIRCUITS</th>
<th>LT P C</th>
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<td>3 1 0 4</td>
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OBJECTIVES:
- To study various number systems, simplify the logical expressions using Boolean functions
- To study implementation of combinational circuits
- To design various synchronous and asynchronous circuits.
- To introduce asynchronous sequential circuits and PLCs
- To introduce digital simulation for development of application oriented logic circuits.

UNIT I NUMBER SYSTEMS AND DIGITAL LOGIC FAMILIES
Review of number systems, binary codes, error detection and correction codes (Parity and Hamming code)
Digital Logic Families, comparison of RTL, DTL, TTL, ECL and MOS families-operation, characteristics of digital logic family.

UNIT II COMBINATIONAL CIRCUITS
Combinational logic - representation of logic functions-SOP and POS forms, K-map representations-
mimization using K maps - simplification and implementation of combinational logic - multiplexers
and demultiplexers - code converters, adders, subtractors.

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS
Sequential logic- SR, JK, D and T flip flops - level triggering and edge triggering - counters -
asynchronous and synchronous type - Modulo counters - Shift registers - design of synchronous
sequential circuits – Moore and Melay models- Counters, state diagram; state reduction; state
assignment.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS AND PROGRAMMABLE LOGIC DEVICES
Asynchronous sequential logic circuits-Transition table, flow table-race conditions, hazards & errors in
digital circuits; analysis of asynchronous sequential logic circuits-introduction to Programmable Logic
Devices: PROM – PLA – PAL.
UNIT V VHDL

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

OUTCOMES:
• Ability to understand and analyse, linear and digital electronic circuits.

TEXT BOOKS:

REFERENCES:

EE6302 ELECTROMAGNETIC THEORY L T P C
3 1 0 4

OBJECTIVES:
• To introduce the basic mathematical concepts related to electromagnetic vector fields
• To impart knowledge on the concepts of electrostatics, electrical potential, energy density and their applications.
• To impart knowledge on the concepts of magnetostatics, magnetic flux density, scalar and vector potential and its applications.
• To impart knowledge on the concepts of Faraday’s law, induced emf and Maxwell’s equations
• To impart knowledge on the concepts of Concepts of electromagnetic waves and Pointing vector.

UNIT I ELECTROSTATICS – I
Sources and effects of electromagnetic fields – Coordinate Systems – Vector fields – Gradient, Divergence, Curl – theorems and applications - Coulomb’s Law – Electric field intensity – Field due to discrete and continuous charges – Gauss’s law and applications.
UNIT II ELECTROSTATICS – II
Electric potential – Electric field and equipotential plots, Uniform and Non-Uniform field, Utilization factor – Electric field in free space, conductors, dielectrics - Dielectric polarization - Dielectric strength - Electric field in multiple dielectrics – Boundary conditions, Poisson’s and Laplace’s equations, Capacitance, Energy density, Applications.

UNIT III MAGNETOSTATICS
Lorentz force, magnetic field intensity (H) – Biot–Savart’s Law - Ampere’s Circuit Law – H due to straight conductors, circular loop, infinite sheet of current, Magnetic flux density (B) – B in free space, conductor, magnetic materials – Magnetization, Magnetic field in multiple media – Boundary conditions, scalar and vector potential, Poisson’s Equation, Magnetic force, Torque, Inductance, Energy density, Applications.

UNIT IV ELECTRODYNAMIC FIELDS

UNIT V ELECTROMAGNETIC WAVES

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

OUTCOMES:
- Ability to understand and apply basic science, circuit theory, Electro-magnetic field theory control theory and apply them to electrical engineering problems.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
To the study of nature and the 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 12
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 10
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 10
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and 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


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

TEXT BOOKS:


REFERENCES:


TOTAL : 45 PERIODS
OBJECTIVES:
The student should be made to:
- Be familiar with the structure of basic electronic devices.
- Be exposed to the operation and applications of electronic devices.

UNIT I PN JUNCTION DEVICES
PN junction diode — structure, operation and V-I characteristics, diffusion and transient capacitance - Rectifiers — Half Wave and Full Wave Rectifier,— Display devices- LED, Laser diodes- Zener diode-characteristics-Zener Reverse characteristics – Zener as regulator

UNIT II TRANSISTORS
BJT, JFET, MOSFET- structure, operation, characteristics and Biasing UJT, Thyristor and IGBT - Structure and characteristics.

UNIT III AMPLIFIERS
BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response – MOSFET small signal model– Analysis of CS and Source follower – Gain and frequency response- High frequency analysis.

UNIT IV MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER
BIMOS cascade amplifier, Differential amplifier – Common mode and Difference mode analysis – FET input stages – Single tuned amplifiers – Gain and frequency response – Neutralization methods, power amplifiers –Types (Qualitative analysis).

UNIT V FEEDBACK AMPLIFIERS AND OSCILLATORS

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

OUTCOMES:
- To explain the structure of the basic electronic devices.
- To design applications using the basic electronic devices.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To study the IC fabrication procedure.
- To study characteristics; realize circuits; design for signal analysis using Op-amp ICs.
- To study the applications of Op-amp.
- To study internal functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits, ADCs.

UNIT I  IC FABRICATION

IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realisation of monolithic ICs and packaging. Fabrication of diodes, capacitance, resistance and FETs.

UNIT II  CHARACTERISTICS OF OPAMP

Ideal OP-AMP characteristics, DC characteristics, AC characteristics,, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp – Inverting and Non-inverting Amplifiers-V/I & I/V converters ,summer, differentiator and integrator.

UNIT III  APPLICATIONS OF OPAMP

Instrumentation amplifier, Log and Antilog Amplifiers, first and second order active filters, comparators, multivibrators, waveform generators, clippers, clampsers, peak detector, S/H circuit, D/A converter (R- 2R ladder and weighted resistor types), A/D converters using opamps.

UNIT IV  SPECIAL ICs

Functional block, characteristics & application circuits with 555 Timer Ic-566 voltage controlled oscillator Ic; 565-phase lock loop Ic ,Analog multiplier ICs.

UNIT V  APPLICATION ICs


OUTCOMES:

- Ability to understand and analyse, linear and digital electronic circuits.

TEXT BOOKS:


REFERENCES:

OBJECTIVES:
To enable the students to understand the behavior of semiconductor device based on experimentation

LIST OF EXPERIMENTS:

1. Characteristics of Semiconductor diode and Zener diode
2. Characteristics of a NPN Transistor under common emitter, common collector and common base configurations
3. Characteristics of JFET (Draw the equivalent circuit)
4. Characteristics of UJT and generation of saw tooth waveforms
5. Design and Frequency response characteristics of a Common Emitter amplifier
6. Characteristics of photo diode & photo transistor, Study of light activated relay circuit
7. Design and testing of RC phase shift, LC oscillators
8. Single Phase half-wave and full wave rectifiers with inductive and capacitive filters
9. Differential amplifiers using FET
10. Study of CRO for frequency and phase measurements
11. Astable and Monostable multivibrators
12. Realization of passive filters

OUTCOMES:
- Ability to understand and analyse, linear and digital electronic circuits.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Semiconductor devices like Diode, Zener Diode, NPN Transistors, JFET, UJT, Photo diode, Photo Transistor
2. Resistors, Capacitors and inductors
3. Necessary digital IC 8
4. Function Generators 10
5. Regulated 3 output Power Supply 5, ± 15V 10
6. CRO 10
7. Storage Oscilloscope 1
8. Bread boards 10
9. Atleast one demo module each for the listed equipments.
10. Component data sheets to be provided

TOTAL: 45 PERIODS
OBJECTIVES:
Working Practice in simulators / CAD Tools / Experiment test bench to learn design, testing and characterizing of circuit behaviour with digital and analog ICs.

LIST OF EXPERIMENTS:
1. Implementation of Boolean Functions, Adder/ Subtractor circuits.
2. Code converters: Excess-3 to BCD and Binary to Gray code converter and vice-versa
3. Parity generator and parity checking
4. Encoders and Decoders
5. Counters: Design and implementation of 4-bit modulo counters as synchronous and asynchronous types using FF IC’s and specific counter IC.
6. Shift Registers: Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC's.
7. Study of multiplexer and demultiplexer
8. Timer IC application: Study of NE/SE 555 timer in Astable, Monostable operation.
10. Study of VCO and PLL ICs:
   i. Voltage to frequency characteristics of NE/ SE 566 IC.
   ii. Frequency multiplication using NE/SE 565 PLL IC.

TOTAL : 45 PERIODS

OUTCOMES:
- Ability to understand and analyse, linear and digital electronic circuits.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

(3 per Batch)

<table>
<thead>
<tr>
<th>S.No</th>
<th>Name of the equipments / Components</th>
<th>Quantity Required</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dual ,(0-30V) variable Power Supply</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>CRO</td>
<td>9</td>
<td>30MHz</td>
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<tr>
<td>3</td>
<td>Digital Multimeter</td>
<td>10</td>
<td>Digital</td>
</tr>
<tr>
<td>4</td>
<td>Function Generator</td>
<td>8</td>
<td>1 MHz</td>
</tr>
<tr>
<td>5</td>
<td>IC Tester (Analog)</td>
<td>2</td>
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</tr>
<tr>
<td>6</td>
<td>Bread board</td>
<td>10</td>
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</tr>
<tr>
<td>7</td>
<td>Computer (PSPICE installed)</td>
<td>1</td>
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</tbody>
</table>
Consumables (Minimum of 25 Nos. each)

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>1</td>
<td>IC 741/ IC NE555/566/565</td>
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<td>Digital IC types</td>
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<tr>
<td>3</td>
<td>LED</td>
<td>25</td>
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<td>6</td>
<td>ICSG3524 / SG3525</td>
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<td>7</td>
<td>Transistor – 2N3391</td>
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<td>8</td>
<td>Diodes, IN4001, BY126</td>
<td>25</td>
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<tr>
<td>9</td>
<td>Zener diodes</td>
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<tr>
<td>10</td>
<td>Potentiometer</td>
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<tr>
<td>11</td>
<td>Step-down transformer 230V/12-0-12V</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Capacitor</td>
<td></td>
</tr>
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<td>13</td>
<td>Resistors 1/4 Watt Assorted</td>
<td>25</td>
</tr>
<tr>
<td>14</td>
<td>Single Strand Wire</td>
<td></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

**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


UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS

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

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

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.

TEXT BOOKS:


REFERENCES:


EE6401 ELECTRICAL MACHINES – I

OBJECTIVES:

- To introduce techniques of magnetic-circuit analysis and introduce magnetic materials
- To familiarize the constructional details, the principle of operation, prediction of performance, the methods of testing the transformers and three phase transformer connections.
- To study the working principles of electrical machines using the concepts of electromechanical energy conversion principles and derive expressions for generated voltage and torque developed in all Electrical Machines.
- To study the working principles of DC machines as Generator types, determination of their no-load/load characteristics, starting and methods of speed control of motors.
- To estimate the various losses taking place in D.C. Motor and to study the different testing methods to arrive at their performance.
UNIT I  MAGNETIC CIRCUITS AND MAGNETIC MATERIALS

UNIT II  TRANSFORMERS

UNIT III  ELECTROMECHANICAL ENERGY CONVERSION AND CONCEPTS IN ROTATING MACHINES
Energy in magnetic system – Field energy and coenergy-force and torque equations – singly and multiply excited magnetic field systems-mmf of distributed windings – Winding Inductances-, magnetic fields in rotating machines – rotating mmf waves – magnetic saturation and leakage fluxes.

UNIT IV  DC GENERATORS

UNIT V  DC MOTORS
Principle and operations - types of DC Motors – Speed Torque Characteristics of DC Motors-starting and speed control of DC motors –Plugging, dynamic and regenerative braking- testing and efficiency – Retardation test- Swinburne’s test and Hopkinson’s test - Permanent magnet dc motors(PMDC)-DC Motor applications.

OUTCOMES:
• Ability to model and analyze electrical apparatus and their application to power system

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
• To get a clear understanding of object-oriented concepts.
• To understand object oriented programming through C++.

UNIT I OVERVIEW
Why Object-Oriented Programming in C++ - Native Types and Statements – Functions and Pointers - Implementing ADTs in the Base Language.

UNIT II BASIC CHARACTERISTICS OF OOP
Data Hiding and Member Functions - Object Creation and Destruction - Polymorphism data abstraction: Iterators and Containers.

UNIT III ADVANCED PROGRAMMING

UNIT IV OVERVIEW OF JAVA
Data types, variables and arrays, operators, control statements, classes, objects, methods – Inheritance

UNIT V EXCEPTION HANDLING
Packages and Interfaces, Exception handling, Multithreaded programming, Strings, Input/Output

TOTAL : 45 PERIODS

OUTCOMES:
• Gain the basic knowledge on Object Oriented concepts.
• Ability to develop applications using Object Oriented Programming Concepts.
• Ability to implement features of object oriented programming to solve real world problems.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To develop expressions for the computation of transmission line parameters.
- To obtain the equivalent circuits for the transmission lines based on distance and operating voltage for determining voltage regulation and efficiency. Also to improve the voltage profile of the transmission system.
- To analyses the voltage distribution in insulator strings and cables and methods to improve the same.
- To understand the operation of the different distribution schemes.

UNIT I  STRUCTURE OF POWER SYSTEM  9
Structure of electric power system: generation, transmission and distribution; Types of AC and DC distributors – distributed and concentrated loads – interconnection – EHVAC and HVDC transmission - Introduction to FACTS.

UNIT II  TRANSMISSION LINE PARAMETERS  9
Parameters of single and three phase transmission lines with single and double circuits - Resistance, inductance and capacitance of solid, stranded and bundled conductors, Symmetrical and unsymmetrical spacing and transposition - application of self and mutual GMD; skin and proximity effects - interference with neighboring communication circuits - Typical configurations, conductor types and electrical parameters of EHV lines, corona discharges.

UNIT III  MODELLING AND PERFORMANCE OF TRANSMISSION LINES  9
Classification of lines - short line, medium line and long line - equivalent circuits, phasor diagram, attenuation constant, phase constant, surge impedance; transmission efficiency and voltage regulation, real and reactive power flow in lines, Power - circle diagrams, surge impedance loading, methods of voltage control; Ferranti effect.

UNIT IV  INSULATORS AND CABLES  9

UNIT V  MECHANICAL DESIGN OF LINES AND GROUNDING  9
Mechanical design of transmission line – sag and tension calculations for different weather conditions, Tower spotting, Types of towers, Substation Layout (AIS, GIS), Methods of grounding.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand and analyze power system operation, stability, control and protection.

TEXT BOOKS:
REFERENCES:

EE6403 DISCRETE TIME SYSTEMS AND SIGNAL PROCESSING  L T P C
3 0 0 3

OBJECTIVES:
- To classify signals and systems & their mathematical representation.
- To analyse the discrete time systems.
- To study various transformation techniques & their computation.
- To study about filters and their design for digital implementation.
- To study about a programmable digital signal processor & quantization effects.

UNIT I    INTRODUCTION
Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect.

UNIT II   DISCRETE TIME SYSTEM ANALYSIS
Z-transform and its properties, inverse z-transforms; difference equation – Solution by z-transform, application to discrete systems - Stability analysis, frequency response – Convolution – Discrete Time Fourier transform, magnitude and phase representation.

UNIT III  DISCRETE FOURIER TRANSFORM & COMPUTATION

UNIT IV  DESIGN OF DIGITAL FILTERS
FIR & IIR filter realization – Parallel & cascade forms. FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics. Analog filter design – Butterworth and Chebyshev approximations; IIR Filters, digital design using impulse invariant and bilinear transformation - mWarping, pre warping.

UNIT V   DIGITAL SIGNAL PROCESSORS

TOTAL : 45 PERIODS
OUTCOMES:

- Ability to understand and apply basic science, circuit theory, Electro-magnetic field theory control theory and apply them to electrical engineering problems.

TEXT BOOKS:


REFERENCES:


EE6404 MEASUREMENTS AND INSTRUMENTATION  L T P C
3 0 0 3

OBJECTIVES:

- To introduce the basic functional elements of instrumentation
- To introduce the fundamentals of electrical and electronic instruments
- To educate on the comparison between various measurement techniques
- To introduce various storage and display devices
- To introduce various transducers and the data acquisition systems

UNIT I INTRODUCTION
Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement – Statistical evaluation of measurement data – Standards and calibration.

UNIT II ELECTRICAL AND ELECTRONICS INSTRUMENTS

UNIT III COMPARISON METHODS OF MEASUREMENTS
UNIT IV        STORAGE AND DISPLAY DEVICES
Magnetic disk and tape – Recorders, digital plotters and printers, CRT display, digital CRO, LED, LCD & dot matrix display – Data Loggers.

UNIT V         TRANSDUCERS AND DATA ACQUISITION SYSTEMS

TOTAL :45 PERIODS

OUTCOMES:
• Ability to model and analyze electrical apparatus and their application to power system

TEXT BOOKS:

REFERENCES:

CS6461 OBJECT ORIENTED PROGRAMMING LABORATORY

OBJECTIVES:
• To get a clear understanding of object-oriented concepts.
• To understand object oriented programming through C++ & JAVA.

LIST OF EXPERIMENTS:
C++:
1. program using functions
   • functions with default arguments
   • implementation of call by value, address, reference
2. simple classes for understanding objects, member functions & constructors
   • classes with primitive data members,
   • classes with arrays as data members
   • classes with pointers as data members
   • classes with constant data members
   • classes with static member functions
3. compile time polymorphism
   • operator overloading
function overloading

4. run time polymorphism
   - inheritance
   - virtual functions
   - virtual base classes
   - templates

5. file handling
   - sequential access
   - random access

JAVA:
6. simple java applications
   - for understanding references to an instant of a class
   - handling strings in JAVA

7. simple package creation
   - developing user defined packages in java

8. interfaces
   - developing user defined interfaces
   - use predefined interfaces

9. threading
   - creation of threading in java applications
   - multi threading

10. exception handling mechanism in java
    - handling predefined exceptions
    - handling user defined exceptions

TOTAL :45 PERIODS

OUTCOMES:
• Gain the basic knowledge on Object Oriented concepts.
• Ability to develop applications using Object Oriented Programming Concepts.
• Ability to implement features of object oriented programming to solve real world problems.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with C++ compiler 30 Nos.

(or)

Server with C++ compiler supporting 30 terminals or more.
OBJECTIVES:
To expose the students to the operation of D.C. machines and transformers and give them experimental skill.

LIST OF EXPERIMENTS:

1. Open circuit and load characteristics of DC shunt generator - critical resistance and critical speed.
2. Load characteristics of DC compound generator with differential and cumulative connections.
3. Load test on DC shunt and compound motor.
4. Load test on DC series motor.
5. Swinburne’s test and speed control of DC shunt motor.
7. Load test on single-phase transformer and three phase transformers.
8. Open circuit and short circuit tests on single phase transformer.
9. Polarity Test and Sumpner’s test on single phase transformers.
10. Separation of no-load losses in single phase transformer.
11. Study of starters and 3-phase transformers connections

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to model and analyze electrical apparatus and their application to power system

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. DC Shunt Motor with Loading Arrangement – 3 nos
2. DC Shunt Motor Coupled With Three phase Alternator – 1 No.
3. Single Phase Transformer – 4 nos
4. DC Series Motor with Loading Arrangement – 1 No.
5. DC compound Motor with Loading Arrangement – 1 No.
6. Three Phase Induction Motor with Loading Arrangement – 2 nos
7. Single Phase Induction Motor with Loading Arrangement – 1 No.
8. DC Shunt Motor Coupled With DC Compound Generator – 2 nos
9. DC Shunt Motor Coupled With DC Shunt Motor – 1 No.
10. Tachometer -Digital/Analog – 8 nos
11. Single Phase Auto Transformer – 2 nos
12. Three Phase Auto Transformer – 1 No.
13. Single Phase Resistive Loading Bank – 2 nos
14. Three Phase Resistive Loading Bank. – 2 nos
15. SPST switch – 2 nos
OBJECTIVES:
• To model the power system under steady state operating condition.
• To apply numerical methods to solve the power flow problem.
• To model and analyze the system under faulted conditions.
• To model and analyze the transient behaviour of power system when it is subjected to
  a fault.

UNIT I  INTRODUCTION
Need for system planning and operational studies – basic components of a power system.-Introduction to restructuring - Single line diagram – per phase and per unit analysis – Generator - transformer – transmission line and load representation for different power system studies.- Primitive network - construction of Y-bus using inspection and singular transformation methods – z-bus.

UNIT II  POWER FLOW ANALYSIS

UNIT III  FAULT ANALYSIS – BALANCED FAULTS

UNIT IV  FAULT ANALYSIS – UNBALANCED FAULTS
Introduction to symmetrical components – sequence impedances – sequence circuits of synchronous machine, transformer and transmission lines - sequence networks analysis of single line to ground, line to line and double line to ground faults using Thevenin’s theorem and Z-bus matrix.

UNIT V  STABILITY ANALYSIS

OUTCOMES:
• Ability to understand and analyze power system operation, stability, control and protection.

TEXT BOOKS:

REFERENCES:

**EE6502 MICROPROCESSORS AND MICROCONTROLLERS**

**OBJECTIVES:**
- To study the Architecture of uP8085 & uC 8051
- To study the addressing modes & instruction set of 8085 & 8051.
- To introduce the need & use of Interrupt structure 8085 & 8051.
- To develop skill in simple applications development with programming 8085 & 8051
- To introduce commonly used peripheral / interfacing

**UNIT I 8085 PROCESSOR**

**UNIT II PROGRAMMING OF 8085 PROCESSOR**
Instruction format and addressing modes – Assembly language format – Data transfer, data manipulation & control instructions – Programming: Loop structure with counting & Indexing – Look up table - Subroutine instructions - stack.

**UNIT III 8051 MICRO CONTROLLER**

**UNIT IV PERIPHERAL INTERFACING**
Study on need, Architecture, configuration and interfacing, with ICs: 8255 , 8259 , 8254,8237,8251, 8279 - A/D and D/A converters &Interfacing with 8085& 8051.

**UNIT V MICRO CONTROLLER PROGRAMMING & APPLICATIONS**

**TOTAL : 45 PERIODS**

**OUTCOMES:**
- Ability to understand and analyse, linear and digital electronic circuits.
- To understand and apply computing platform and software for engineering problems.
TEXT BOOKS:

REFERENCES:

ME6701 POWER PLANT ENGINEERING L T P C 3 0 0 3

OBJECTIVES:
- Providing an overview of Power Plants and detailing the role of Mechanical Engineers in their operation and maintenance.

UNIT I COAL BASED THERMAL POWER PLANTS 10

UNIT II DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS 10

UNIT III NUCLEAR POWER PLANTS 7

UNIT IV POWER FROM RENEWABLE ENERGY 10
Hydro Electric Power Plants – Classification, Typical Layout and associated components including Turbines. Principle, Construction and working of Wind, Tidal, Solar Photo Voltaic (SPV), Solar Thermal, Geo Thermal, Biogas and Fuel Cell power systems.

UNIT V ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS 8
Power tariff types, Load distribution parameters, load curve, Comparison of site selection criteria, relative merits & demerits, Capital & Operating Cost of different power plants. Pollution control technologies including Waste Disposal Options for Coal and Nuclear Power Plants.
TOTAL : 45 PERIODS

OUTCOMES:
- Upon completion of this course, the Students can able to understand different types of power plant, and its functions and their flow lines and issues related to them.
- Analyse and solve energy and economic related issues in power sectors.

TEXT BOOK:

REFERENCES:

OBJECTIVES:
- To get an overview of different types of power semiconductor devices and their switching characteristics.
- To understand the operation, characteristics and performance parameters of controlled rectifiers.
- To study the operation, switching techniques and basics topologies of DC-DC switching regulators.
- To learn the different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.
- To study the operation of AC voltage controller and various configurations.

UNIT I POWERSEMI-CONDUCTOR DEVICES
Study of switching devices, Diode, SCR, TRIAC, GTO, BJT, MOSFET, IGBT-Static and Dynamic characteristics - Triggering and commutation circuit for SCR- Design of Driver and snubber circuit.

UNIT II PHASE-CONTROLLED CONVERTERS
2-pulse, 3-pulse and 6-pulse converters– performance parameters –Effect of source inductance—— Gate Circuit Schemes for Phase Control–Dual converters.

UNIT III DC TO DC CONVERTER
UNIT IV INVERTERS
Single phase and three phase voltage source inverters (both 120° and 180° mode) – Voltage & harmonic control – PWM techniques: Sinusoidal PWM, modified sinusoidal PWM – Introduction to space vector modulation – Current source inverter.

UNIT V AC TO AC CONVERTERS
Single phase and Three phase AC voltage controllers – Control strategy – Power Factor Control – Multistage sequence control – single phase and three phase cyclo converters – Introduction to Matrix converters.

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to understand and analyse, linear and digital electronic circuits.

TEXT BOOKS:

REFERENCES:

EE6504 ELECTRICAL MACHINES – II

OBJECTIVES:
- To impart knowledge on Construction and performance of salient and non-salient type synchronous generators.
- To impart knowledge on Principle of operation and performance of synchronous motor.
- To impart knowledge on Construction, principle of operation and performance of induction machines.
- To impart knowledge on Starting and speed control of three-phase induction motors.
- To impart knowledge on Construction, principle of operation and performance of single phase induction motors and special machines.

UNIT I SYNCHRONOUS GENERATOR
Constructional details – Types of rotors – winding factors- emf equation – Synchronous reactance – Armature reaction – Phasor diagrams of non salient pole synchronous generator connected to infinite bus– Synchronizing and parallel operation – Synchronizing torque - Change of excitation and...
mechanical input– Voltage regulation – EMF, MMF, ZPF and A.S.A methods – steady state power-angle characteristics– Two reaction theory –slip test -short circuit transients - Capability Curves

UNIT II  SYNCHRONOUS MOTOR
Principle of operation – Torque equation – Operation on infinite bus bars - V and Inverted V curves – Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed-Hunting – natural frequency of oscillations – damper windings- synchronous condenser.

UNIT III  THREE PHASE INDUCTION MOTOR

UNIT IV  STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR

UNIT V  SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES

OUTCOMES:
• Ability to model and analyze electrical apparatus and their application to power system

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To understand the use of transfer function models for analysis physical systems and introduce the control system components.
- To provide adequate knowledge in the time response of systems and steady state error analysis.
- To accord basic knowledge in obtaining the open loop and closed-loop frequency responses of systems.
- To introduce stability analysis and design of compensators.
- To introduce state variable representation of physical systems and study the effect of state feedback.

UNIT I  SYSTEMS AND THEIR REPRESENTATION  9

UNIT II  TIME RESPONSE  9

UNIT III  FREQUENCY RESPONSE  9
Frequency response – Bode plot – Polar plot – Determination of closed loop response from open loop response - Correlation between frequency domain and time domain specifications- Effect of Lag, lead and lag-lead compensation on frequency response- Analysis.

UNIT IV  STABILITY AND COMPENSATOR DESIGN  9
Characteristics equation – Routh Hurwitz criterion – Nyquist stability criterion - Performance criteria – Lag, lead and lag-lead networks – Lag/Lead compensator design using bode plots.

UNIT V  STATE VARIABLE ANALYSIS  9

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

OUTCOMES:
- Ability to understand and apply basic science, circuit theory, theory control theory Signal processing and apply them to electrical engineering problems.

TEXT BOOKS:

REFERENCES:
EE6511 CONTROL AND INSTRUMENTATION LABORATORY LT P C 0 0 3 2

OBJECTIVES:
To provide knowledge on analysis and design of control system along with basics of instrumentation

LIST OF EXPERIMENTS:

CONTROLSYSTEMS:
1. P, PI and PID controllers
2. Stability Analysis
4. Design of Lag, Lead and Lag-Lead Compensators
5. Position Control Systems
6. Synchro-Transmitter- Receiver and Characteristics
7. Simulation of Control Systems by Mathematical development tools.

INSTRUMENTATION:
8. Bridge Networks –AC and DC Bridges

TOTAL : 45 PERIODS

OUTCOMES:
• Ability to understand and apply basic science, circuit theory, Electro-magnetic field theory
control theory and apply them to electrical engineering problems.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

CONTROLSYSTEMS:
1. PID kit – 1 No.
   DSO – 1 No.
   CRO Probe – 2 nos
2. Personal computers
3. DC motor – 1 No.
   Generator – 1 No. Rheostats – 2 nos
   Ammeters Voltmeters
   Connecting wires (3/20)
4. CRO 30MHz – 1 No.
   2MHz Function Generator – 1No.
5. Position Control Systems Kit (with manual) – 1 No., Tacho Generator Coupling set
6. AC Synchro transmitter& receiver – 1No.
   Digital multi meters

INSTRUMENTATION:
7. R, L, C Bridge kit (with manual)
8. a) Electric heater – 1No.
   Thermometer – 1No.Thermistors (silicon type) RTD nickel type – 1No.
   b) 30 psi Pressure chamber (complete set) – 1No. Current generator (0 – 20mA)
   Air foot pump – 1 No. (with necessary connecting tubes)
   c) LVDT 20mm core length movable type – 1No. CRO 30MHz – 1No.
   d) Optical sensor – 1 No. Light source
   e) Strain Gauge Kit with Handy lever beam – 1No.
   100gm weights – 10 nos
   f) Flow measurement Trainer kit – 1 No.
   (1/2 HP Motor, Water tank, Digital Milliammeter, complete set)
   Watthour meter (energy meter) – 1No. Ammeter
   Voltmeter Rheostat Stop watch
   Connecting wires (3/20)
10. IC Transistor kit – 1No.
OBJECTIVES:
- To provide opportunities to learners to practice their communicative skills to make them become proficient users of English.
- To enable learners to fine-tune their linguistic skills (LSRW) with the help of technology to communicate globally.
- To enhance the performance of learners at placement interviews and group discussions and other recruitment procedures.

UNIT I LISTENING/VIEWING 10
Listening and note-taking – Listening to telephonic conversations – Ted talks – Inspiring Speeches – Watching documentaries on personalities, places, socio-cultural events, TV news programmes and discussions to answer different kinds questions, viz., identifying key idea and comprehension questions... so on.

UNIT II SPEAKING 12

UNIT III READING 10
Different genres of text (literature, media, technical) for comprehension – Reading strategies like note-making – reading graphs, charts and graphic organizer – Sequencing sentences – reading online sources like e-books, e-journals and e-newspapers.

UNIT IV WRITING 12

UNIT V VOCABULARY 8
Idioms and Phrases – Proverbs – Collocations – Chunks of language.

UNIT VI GRAMMAR 8
Sentence structures – Subject-Verb agreement – Pronoun-Antecedent agreement – Tense forms – Active and passive voices – Direct and Indirect speeches – Cohesive devices.

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>Server</td>
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<tr>
<td></td>
<td>• PIV System</td>
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<td>• 1 GB RAM / 40 GB HDD</td>
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<tr>
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<td>• OS: Win 2000 server</td>
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</tr>
<tr>
<td></td>
<td>• Audio card with headphones</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• JRE 1.3</td>
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<tr>
<td>2</td>
<td>Client Systems</td>
<td>60 Nos.</td>
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<tr>
<td></td>
<td>• PIII System</td>
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</tr>
<tr>
<td></td>
<td>• 256 or 512 MB RAM / 40 GB HDD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• OS: Win 2000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Audio card with headphones</td>
<td></td>
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<td></td>
<td>• JRE 1.3</td>
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<tr>
<td>3</td>
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<td>Television 46”</td>
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<tr>
<td>5</td>
<td>Collar mike</td>
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</tr>
<tr>
<td>6</td>
<td>Cordless mike</td>
<td>1 No.</td>
</tr>
<tr>
<td>7</td>
<td>Audio Mixer</td>
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</tr>
<tr>
<td>8</td>
<td>DVD recorder/player</td>
<td>1 No.</td>
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<tr>
<td>9</td>
<td>LCD Projector with MP3/CD/DVD provision for Audio/video facility</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
- Online Test - 35 marks
- Interview - 15 marks
- Presentation - 15 marks
- Group Discussion - 15 marks

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, case studies and abstract concept

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:

WEB SOURCES:
www.humanresources.about.com
www.careerride.com

EE6512 ELECTRICAL MACHINES LABORATORY - II

OBJECTIVES:
To expose the students to the operation of synchronous machines and induction motors and give them experimental skill.

LIST OF EXPERIMENTS:

1. Regulation of three phase alternator by emf and mmf methods.
2. Regulation of three phase alternator by ZPF and ASA methods.
3. Regulation of three phase salient pole alternator by slip test.
4. Measurements of negative sequence and zero sequence impedance of alternators.
5. V and Inverted V curves of Three Phase Synchronous Motor.
7. No load and blocked rotor test on three-phase induction motor(Determination of equivalent circuit parameters).
10. No load and blocked rotor test on single-phase induction motor.
11. Study of Induction motor Starters

TOTAL : 45 PERIODS

OUTCOMES:
• Ability to model and analyze electrical apparatus and their application to power system
LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Synchronous Induction motor 3HP – 1 No.
2. DC Shunt Motor Coupled With Three phase Alternator – 4 nos
3. DC Shunt Motor Coupled With Three phase Slip ring Induction motor – 1 No.
4. Three Phase Induction Motor with Loading Arrangement – 2 nos
5. Single Phase Induction Motor with Loading Arrangement – 2 nos
6. Tachometer -Digital/Analog – 8 nos
7. BLDC Motor – 1 No.
8. Single Phase Auto Transformer – 2 nos
9. Three Phase Auto Transformer – 3 nos
10. Single Phase Resistive Loading Bank – 2 nos
11. Three Phase Resistive Loading Bank – 2 nos
13. SPST switch – 2 nos

EC6651 COMMUNICATION ENGINEERING LT P C 3 0 0 3

OBJECTIVES:
- To introduce different methods of analog communication and their significance
- To introduce Digital Communication methods for high bit rate transmission
- To introduce the concepts of source and line coding techniques for enhancing rating of transmission of minimizing the errors in transmission.
- To introduce MAC used in communication systems for enhancing the number of users.
- To introduce various media for digital communication

UNIT I ANALOG COMMUNICATION

UNIT II DIGITAL COMMUNICATION
Pulse modulations – concepts of sampling and sampling theormes, PAM, PWM, PPM, PTM, quantization and coding : DCM, DM, slope overload error. ADM, DPCM, OOK systems – ASK, FSK, PSK, BSK, QPSK, QAM, MSK, GMSK, applications of Data communication.

UNIT III SOURCE CODES, LINE CODES & ERROR CONTROL (Qualitative only)
UNIT IV   MULTIPLE ACCESS TECHNIQUES  9
SS&MA techniques : FDMA, TDMA, CDMA, SDMA application in wire and wireless communication :
Advantages (merits) :

UNIT V   SATELLITE, OPTICAL FIBER – POWERLINE, SCADA  9
Orbits : types of satellites : frequency used link establishment, MA techniques used in satellite
communication, earth station; aperture actuators used in satellite – Intelsat and Insat: fibers – types:
sources, detectors used, digital filters, optical link: power line carrier communications: SCADA

OUTCOMES:
• Ability to understand and analyse, linear and digital electronic circuits.

TEXT BOOKS:

REFERENCES:

EE6601        SOLID STATE DRIVES       L T P C
                          3 0 0 3

OBJECTIVES:
• To understand steady state operation and transient dynamics of a motor load system.
• To study and analyze the operation of the converter/chopper fed dc drive, both qualitatively and
  quantitatively.
• To study and understand the operation and performance of AC motor drives.
• To analyze and design the current and speed controllers for a closed loop solid state DC motor
  drive.

UNIT I   DRIVE CHARACTERISTICS  9
Electric drive – Equations governing motor load dynamics – steady state stability – multi quadrant
Dynamics: acceleration, deceleration, starting & stopping – typical load torque characteristics –
Selection of motor.

UNIT II   CONVERTER / CHOPPER FED DC MOTOR DRIVE  9
Steady state analysis of the single and three phase converter fed separately excited DC motor
drive–continuous and discontinuous conduction– Time ratio and current limit control – 4 quadrant
operation of converter / chopper fed drive.

UNIT III   INDUCTION MOTOR DRIVES  9
Stator voltage control–energy efficient drive–v/f control–constant airgap flux–field weakening mode
– voltage / current fed inverter – closed loop control.

UNIT IV  SYNCHRONOUS MOTOR DRIVES

V/f control and self control of synchronous motor: Margin angle control and power factor control – permanent magnet synchronous motor.

UNIT V  DESIGN OF CONTROLLERS FOR DRIVES

Transfer function for DC motor / load and converter – closed loop control with Current and speed feedback – armature voltage control and field weakening mode – Design of controllers; current controller and speed controller - converter selection and characteristics.

OUTCOMES:

• Ability to understand and apply basic science, circuit theory, Electro-magnetic field theory control theory and apply them to electrical engineering problems.

TEXT BOOKS:


REFERENCES:

methods- Timer and Counting devices, Watchdog Timer, Real Time Clock, In circuit emulator, Target Hardware Debugging.

UNIT II EMBEDDED NETWORKING

UNIT III EMBEDDED FIRMWARE DEVELOPMENT ENVIRONMENT
Embedded Product Development Life Cycle- objectives, different phases of EDLC, Modelling of EDLC; issues in Hardware-software Co-design, Data Flow Graph, state machine model, Sequential Program Model, concurrent Model, object oriented Model.

UNIT IV RTOS BASED EMBEDDED SYSTEM DESIGN
Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Mutitasking, Preemptive and non-preemptive scheduling, Task communication-shared memory, message passing-, Inter process Communication – synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance, comparison of Real time Operating systems: Vx Works, ϋC/OS-II, RT Linux.

UNIT V EMBEDDED SYSTEM APPLICATION DEVELOPMENT
Case Study of Washing Machine- Automotive Application- Smart card System Application.,

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to understand and analyse, linear and digital electronic circuits.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
• To have an overview of power system operation and control.
• To model power-frequency dynamics and to design power-frequency controller.
• To model reactive power-voltage interaction and the control actions to be implemented for maintaining the voltage profile against varying system load.
• To study the economic operation of power system.
• To teach about SCADA and its application for real time operation and control of power systems.

UNIT I INTRODUCTION
An overview of power system operation and control - system load variation - load characteristics - load curves and load-duration curve - load factor - diversity factor - Importance of load forecasting and quadratic and exponential curve fitting techniques of forecasting – plant level and system level controls.

UNIT II REAL POWER - FREQUENCY CONTROL
Basics of speed governing mechanism and modeling - speed-load characteristics – load sharing between two synchronous machines in parallel - control area concept - LFC control of a single-area system - static and dynamic analysis of uncontrolled and controlled cases - two-area system – modeling - static analysis of uncontrolled case - tie line with frequency bias control - state variable model - integration of economic dispatch control with LFC.

UNIT III REACTIVE POWER–VOLTAGE CONTROL
Generation and absorption of reactive power - basics of reactive power control - excitation systems – modeling - static and dynamic analysis - stability compensation - methods of voltage control: tap-changing transformer, SVC (TCR + TSC) and STATCOM – secondary voltage control.

UNIT IV UNIT COMMITMENT AND ECONOMIC DISPATCH

UNIT V COMPUTER CONTROL OF POWER SYSTEMS
Need for computer control of power systems - concept of energy control centre - functions - system monitoring - data acquisition and control - system hardware configuration – SCADA and EMS functions - network topology - state estimation –WLSE - Contingency Analysis - state transition diagram showing various state transitions and control strategies.

TOTAL : 45 PERIODS

OUTCOMES:
• Ability to understand and analyze power system operation, stability, control and protection.

TEXT BOOKS:
REFERENCES:

EE6604 DESIGN OF ELECTRICAL MACHINES LT P C 3 1 0 4

OBJECTIVES:
• To study mmf calculation and thermal rating of various types of electrical machines.
• To design armature and field systems for D.C. machines.
• To design core, yoke, windings and cooling systems of transformers.
• To design stator and rotor of induction machines.
• To design stator and rotor of synchronous machines and study their thermal behaviour.

UNIT I INTRODUCTION

UNIT II DC MACHINES

UNIT III TRANSFORMERS

UNIT IV INDUCTION MOTORS

UNIT V SYNCHRONOUS MACHINES
TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:
• Ability to model and analyze electrical apparatus and their application to power system

TEXT BOOKS:

REFERENCES:

EE6611 POWER ELECTRONICS AND DRIVES LABORATORY LT P C 0 0 3 2

OBJECTIVES:
To provide hands on experience with power electronic converter design and testing

LIST OF EXPERIMENTS:
1. Gate Pulse Generation using R,RC and UJT.
2. Characteristics of SCR and Triac
3. Characteristics of MOSFET and IGBT
4. AC to DC half controlled converter
5. AC to DC fully controlled Converter
6. Step down and step up MOSFET based choppers
7. IGBT based single phase PWM inverter
8. IGBT based three phase PWM inverter
9. AC Voltage controller
10. Switched mode power converter.
11. SimulationofPEcircuits(1Φ&3Φsemiconverter,1Φ&3Φfullconverter,dc-dc converters, ac voltage controllers).

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to understand and analyse, linear and digital electronic circuits.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
1. Device characteristics(for SCR, MOSFET, TRIAC and IGBT kit with builtin / discrete power supply and meters) - 2 each
2. SinglephaseSCRbasedhalfcontrolledconverterandfullycontrolledconverteralong with built-in/separate/firing circuit/module and meter – 2 each
3. MOSFET based step up and step down choppers (Built in/ Discrete) – 1 each
4. IGBT based single phase PWM inverter
   module/Discrete Component – 2
5. IGBT based three phase PWM inverter
   module/Discrete Component – 2
6. Switched mode power converter
   module/Discrete Component – 2
7. SCR & TRIAC based 1 phase AC controller along with lamp or rheostat load - 2
8. Cyclo converter kit with firing module –
9. Dual regulated Dc power supply with common ground
10. Cathode ray Oscilloscope – 10
11. Isolation Transformer – 5
12. Single phase Auto transformer – 3
13. Components (Inductance, Capacitance ) 3 set for each
14. Multimeter – 5
15. LCR meter – 3
16. Rheostats of various ranges – 2 sets of 10 value
17. Work tables – 10
18. DC and AC meters of required ranges – 20
19. Component data sheets to be provided

EE6612 MICROPROCESSORS AND MICROCONTROLLERS LABORATORY

OBJECTIVES:
To provide training on programming of microprocessors and microcontrollers and understand the interface requirements.

LIST OF EXPERIMENTS:

1. Simple arithmetic operations: addition / subtraction / multiplication / division.
2. Programming with control instructions:
   (i) Ascending / Descending order, Maximum / Minimum of numbers
   (ii) Programs using Rotate instructions
   (iii) Hex / ASCII / BCD code conversions.
3. Interface Experiments: with 8085
   (i) A/D Interfacing. & D/A Interfacing.
4. Traffic light controller.
5. I/O Port / Serial communication
6. Programming Practices with Simulators/Emulators/open source
7. Read a key, interface display
8. Demonstration of basic instructions with 8051 Micro controller execution, including:
   (i) Conditional jumps, looping
Calling subroutines.
9. Programming I/O Port 8051
   (i) study on interface with A/D & D/A
   (ii) study on interface with DC & AC motor.
10. Mini project development with processors.

**TOTAL: 45 PERIODS**

**OUTCOMES:**
- Ability to understand and analyse, linear and digital electronic circuits.
- To understand and apply computing platform and software for engineering problems.

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

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Description of Equipment</th>
<th>Quantity required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>8085 Microprocessor Trainer with Power Supply</td>
<td>15</td>
</tr>
<tr>
<td>2.</td>
<td>8051 Micro Controller Trainer Kit with power supply</td>
<td>15</td>
</tr>
<tr>
<td>3.</td>
<td>8255 Interface board</td>
<td>5</td>
</tr>
<tr>
<td>4.</td>
<td>8251 Interface board</td>
<td>5</td>
</tr>
<tr>
<td>5.</td>
<td>8259 Interface board</td>
<td>5</td>
</tr>
<tr>
<td>6.</td>
<td>8279 Keyboard / Display Interface board</td>
<td>5</td>
</tr>
<tr>
<td>7.</td>
<td>8254 timer counter</td>
<td>5</td>
</tr>
<tr>
<td>8.</td>
<td>ADC and DAC card</td>
<td>5</td>
</tr>
<tr>
<td>9.</td>
<td>AC &amp; DC motor with Controller</td>
<td>5</td>
</tr>
<tr>
<td>10.</td>
<td>Traffic Light Control System</td>
<td>5</td>
</tr>
</tbody>
</table>

**EE6613 PRESENTATION SKILLS AND TECHNICAL SEMINAR**

**OBJECTIVES:**
- To encourage the students to study advanced engineering developments
- To prepare and present technical reports.
- To encourage the students to use various teaching aids such as overhead projectors, power point presentation and demonstrative models.

**METHOD OF EVALUATION:**

During the seminar session each student is expected to prepare and present a topic on engineering/technology, for a duration of about 8 to 10 minutes. In a session of three periods per week, 15 students are expected to present the seminar. Each student is expected to present at least twice during the semester and the student is evaluated based on that. At the end of the semester, he/she can submit a report on his/her topic of seminar and marks are given based on the report. A faculty guide is to be allotted and he/she will guide and monitor the progress of the student and maintain attendance also. Evaluation is 100% internal.

**TOTAL : 30 PERIODS**
UNIT I OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS 9
Causes of over voltages and its effects on power system – Lightning, switching surges and temporary overvoltages, Corona and its effects – Reflection and Refraction of Travelling waves- Protection against overvoltages.

UNIT II DIELECTRIC BREAKDOWN 9
Gaseous breakdown in uniform and non-uniform fields – Corona discharges – Vacuum breakdown – Conduction and breakdown in pure and commercial liquids, Maintenance of oil Quality – Breakdown mechanisms in solid and composite dielectrics.

UNIT III GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS 9
Generation of High DC, AC, impulse voltages and currents - Triggering and control of impulse generators.

UNIT IV MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS 9

UNIT V HIGH VOLTAGE TESTING & INSULATION COORDINATION 9
High voltage testing of electrical power apparatus as per International and Indian standards – Power frequency, impulse voltage and DC testing of Insulators, circuit breakers, bushing, isolators and transformers- Insulation Coordination.

TOTAL : 45 PERIODS

OUTCOMES:
- Ability to understand and analyze power system operation, stability, control and protection.

TEXT BOOKS:
REFERENCES:

EE6702 PROTECTION AND SWITCHGEAR L T P C
3 0 0 3

OBJECTIVES:
• To educate the causes of abnormal operating conditions (faults, lightning and switching surges) of the apparatus and system.
• To introduce the characteristics and functions of relays and protection schemes.
• To impart knowledge on apparatus protection
• To introduce static and numerical relays
• To impart knowledge on functioning of circuit breakers

UNIT I PROTECTION SCHEMES
Principles and need for protective schemes – nature and causes of faults – types of faults – fault current calculation using symmetrical components – Methods of Neutral grounding – Zones of protection and essential qualities of protection – Protection schemes

UNIT II ELECTROMAGNETIC RELAYS
Operating principles of relays – the Universal relay – Torque equation – R-X diagram – Electromagnetic Relays – Overcurrent, Directional, Distance, Differential, Negative sequence and Under frequency relays.

UNIT III APPARATUS PROTECTION
Current transformers and Potential transformers and their applications in protection schemes - Protection of transformer, generator, motor, busbars and transmission line.

UNIT IV STATIC RELAYS AND NUMERICAL PROTECTION
Static relays – Phase, Amplitude Comparators – Synthesis of various relays using Static comparators – Block diagram of Numerical relays – Overcurrent protection, transformer differential protection, distant protection of transmission lines.

UNIT V CIRCUIT BREAKERS

TOTAL : 45 PERIODS

OUTCOMES:
• Ability to understand and analyze power system operation, stability, control and protection.
TEXT BOOKS:

REFERENCES:

EE6703 SPECIAL ELECTRICAL MACHINES LT P C 3 0 0 3

OBJECTIVES:
- To impart knowledge on Construction, principle of operation and performance of synchronous reluctance motors.
- To impart knowledge on the Construction, principle of operation, control and performance of stepping motors.
- To impart knowledge on the Construction, principle of operation, control and performance of switched reluctance motors.
- To impart knowledge on the Construction, principle of operation, control and performance of permanent magnet brushless D.C. motors.
- To impart knowledge on the Construction, principle of operation and performance of permanent magnet synchronous motors.

UNIT I SYNCHRONOUS RELUCTANCE MOTORS

UNIT II STEPPER MOTORS

UNIT III SWITCHED RELUCTANCE MOTORS (SRM)
Methods of Rotor position sensing – Sensor less operation – Characteristics and Closed loop control – Applications.

UNIT IV PERMANENT MAGNET BRUSHLESS D.C. MOTORS

UNIT V PERMANENT MAGNET SYNCHRONOUS MOTORS (PMSM)

OUTCOMES:
• Ability to model and analyze electrical apparatus and their application to power system

TEXT BOOKS:

REFERENCES:

MG6851 PRINCIPLES OF MANAGEMENT

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

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
To provide better understanding of power system analysis through digital simulation

LIST OF EXPERIMENTS:
1. Computation of Parameters and Modelling of Transmission Lines
2. Formation of Bus Admittance and Impedance Matrices and Solution of Networks.
5. Fault Analysis
7. Transient Stability Analysis of Multi machine Power Systems
8. Electromagnetic Transients in Power Systems

TOTAL : 45 PERIODS

OUTCOMES:
• Ability to understand and analyze power system operation, stability, control and protection.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
1. Personal computers (Pentium-IV, 80GB, 512 MBRAM) – 25 nos
2. Printer laser- 1 No.
3. Dot matrix- 1 No.
4. Server (Pentium IV, 80GB, 1GBRAM) (High Speed Processor) – 1 No.
5. Software: any power system simulation software - 5 licenses

OBJECTIVES:
To encourage the students to comprehend the knowledge acquired from the first Semester to Sixth Semester of B.E Degree Course through periodic exercise.

METHOD OF EVALUATION:
The students will be assessed 100% internally through weekly test with objective type questions on all the subject related topics

OUTCOMES:
• Ability to review, prepare and present technological developments

TOTAL : 30 PERIODS
OBJECTIVES:
• To analyze the various concepts behind renewable energy resources.
• To introduce the energy saving concept by different ways of illumination.
• To understand the different methods of electric heating and electric welding.
• To introduce knowledge on Solar Radiation and Solar Energy Collectors
• To introduce concepts of Wind Energy and its utilization

UNIT I  ELECTRIC DRIVES AND TRACTION
Fundamentals of electric drive - choice of an electric motor - application of motors for particular services - traction motors - characteristic features of traction motor - systems of railway electrification - electric braking - train movement and energy consumption - traction motor control - track equipment and collection gear.

UNIT II  ILLUMINATION
Introduction - definition and meaning of terms used in illumination engineering - classification of light sources - incandescent lamps, sodium vapour lamps, mercury vapour lamps, fluorescent lamps – design of illumination systems - indoor lighting schemes - factory lighting halls - outdoor lighting schemes - flood lighting - street lighting - energy saving lamps, LED.

UNIT III  HEATING AND WELDING

UNIT IV  SOLAR RADIATION AND SOLAR ENERGY COLLECTORS

UNIT V  WIND ENERGY
Introduction - basic principles of wind energy conversion - site selection considerations - basic components of a WECS (Wind Energy Conversion System) - Classification of WECS - types of wind Turbines - analysis of aerodynamic forces acting on the blade - performances of wind.

TOTAL : 45 PERIODS

OUTCOMES:
• Ability to understand and analyze power system operation, stability, control and protection.
• Ability to handle the engineering aspects of electrical energy generation and utilization.

TEXT BOOKS:
REFERENCES:

EE6811 PROJECT WORK L T P C
0 0 12 6

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.
OBJECTIVES:
- To study about the concepts of windows programming models, MFC applications, drawing with the GDI, getting inputs from Mouse and the Keyboard.
- To study the concepts of Menu basics, menu magic and classic controls of the windows programming using VC++.
- To study the concept of Document/View Architecture with single & multiple document interface, toolbars, status bars and File I/O Serialization.
- To study about the integrated development programming event driven programming, variables, constants, procedures and basic ActiveX controls in visual basic.
- To understand the database and the database management system, visual data manager, data bound controls and ADO controls in VB.

UNIT I  FUNDAMENTALS OF WINDOWS AND MFC

UNIT II  RESOURCES AND CONTROLS
Creating a menu – Loading and displaying a menu – Responding to menu commands – Command ranges - Updating the items in menu, update ranges – Keyboard accelerators. Creating menus programmatically - Modifying menus programmatically - The system menu - Owner draw menus – Cascading menus - Context menus. The C button class – C list box class – C static class - The font view application – C edit class – C combo box class – C scrollbar class. Model dialog boxes – Modeless dialog boxes.

UNIT III  DOCUMENT / VIEW ARCHITECTURE

UNIT IV  FUNDAMENTALS OF VISUAL BASIC

UNIT V DATABASE PROGRAMMING WITH VB


OUTCOMES:
• To understand and apply computing platform and software for engineering problems.

TEXT BOOKS:

REFERENCES:

IC6601 ADVANCED CONTROL SYSTEM

OBJECTIVES:
• To provide knowledge on design in state variable form
• To provide knowledge in phase plane analysis.
• To give basic knowledge in describing function analysis.
• To study the design of optimal controller.
• To study the design of optimal estimator including Kalman Filter

UNIT I STATE VARIABLE DESIGN

UNIT II PHASE PLANE ANALYSIS

UNIT III Describing Function Analysis
OUTCOMES:
- Ability to apply advanced control theory to practical engineering problems.

TEXT BOOKS:

REFERENCES:
regulation - capacitance switching with a restrike, with multiple restrikes. Illustration for multiple restriking transients - ferro resonance.

UNIT III LIGHTNING TRANSIENTS
Review of the theories in the formation of clouds and charge formation - rate of charging of thunder clouds – mechanism of lightning discharges and characteristics of lightning strokes – model for lightning stroke - factors contributing to good line design - protection using ground wires - tower footing resistance - Interaction between lightning and power system.

UNIT IV TRAVELING WAVES ON TRANSMISSION LINE COMPUTATION OF TRANSIENTS
Computation of transients - transient response of systems with series and shunt lumped parameters and distributed lines. Traveling wave concept - step response - Bewely’s lattice diagram - standing waves and natural frequencies - reflection and refraction of travelling waves.

UNIT V TRANSIENTS IN INTEGRATED POWER SYSTEM
The short line and kilometric fault - distribution of voltages in a power system - Line dropping and load rejection - voltage transients on closing and reclosing lines - over voltage induced by faults -switching surges on integrated system Qualitative application of EMTP for transient computation.

TOTAL : 45 PERIODS

OUTCOMES:
- Ability to understand and analyze power system operation, stability, control and protection.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To introduce the basic concepts of linear programming
- To educate on the advancements in Linear programming techniques
- To introduce non-linear programming techniques
- To introduce the interior point methods of solving problems
- To introduce the dynamic programming method

UNIT I  LINEAR PROGRAMMING  9

UNIT II  ADVANCES IN LPP  9
Dualit theory- Dual simplex method - Sensitivity analysis—Transportation problems— Assignment problems-Traveling sales man problem -Data Envelopment Analysis.

UNIT III  NON LINEAR PROGRAMMING  9
Classification of Non Linear programming – Lagrange multiplier method – Karush – Kuhn Tucker conditions–Reduced gradient algorithms–Quadratic programming method – Penalty and Barrier method.

UNIT IV  INTERIOR POINT METHODS  9

UNIT V  DYNAMIC PROGRAMMING  9

OUTCOMES:

- To understand ethical issues, environmental impact and acquire management skills.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To expose the basic concepts of optical fibers and their industrial applications.
- To provide adequate knowledge about Industrial application of optical fibres.
- To provide basic concepts of lasers.
- To provide knowledge about Industrial application of lasers
- To provide knowledge about Industrial application of Holography and Medical applications of Lasers.

UNIT I  OPTICAL FIBRES AND THEIR PROPERTIES  9

UNIT II  INDUSTRIAL APPLICATION OF OPTICAL FIBRES  9

UNIT III  LASER FUNDAMENTALS  9

UNIT IV  INDUSTRIAL APPLICATION OF LASERS  9
Laser for measurement of distance, length, velocity, acceleration, current, voltage and Atmospheric effect – Material processing – Laser heating, welding, melting and trimming of material – Removal and vaporization.

UNIT V  HOLOGRAM AND MEDICAL APPLICATIONS  9

TOTAL : 45 PERIODS

OUTCOMES:
- Ability to understand and analyze Instrumentation systems and their applications to various industries.

TEXT BOOKS:

REFERENCES:
1. Asu Ram Jha, Fiber Optic Technology Applications to commercial, Industrial, Military and Space Optical systems, PHI learning Private limited, 2009.
OBJECTIVES:
- To Introduce Fundamentals of Biomedical Engineering
- To study the communication mechanics in a biomedical system with few examples
- To study measurement of certain important electrical and non-electrical parameters
- To understand the basic principles in imaging techniques
- To have a basic knowledge in life assisting and therapeutic devices

UNIT I  FUNDAMENTALS OF BIOMEDICAL ENGINEERING  9

UNIT II  NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC PROCEDURES  9

UNIT III  ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS  9

UNIT IV  IMAGING MODALITIES AND ANALYSIS  9

UNIT V  LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES  9

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to understand and analyze Instrumentation systems and their applications to various industries.

TEXT BOOKS:
REFERENCES:

EE6004 FLEXIBLE AC TRANSMISSION SYSTEMS L T P C 3 0 0 3

OBJECTIVES:
- To introduce the reactive power control techniques
- To educate on static VAR compensators and their applications
- To provide knowledge on Thyristor controlled series capacitors
- To educate on STATCOM devices
- To provide knowledge on FACTS controllers

UNIT I INTRODUCTION
Reactive power control in electrical power transmission lines - Uncompensated transmission line - series compensation - Basic concepts of Static Var Compensator (SVC) – Thyristor Controlled Series capacitor (TCSC) – Unified power flow controller (UPFC).

UNIT II STATIC VAR COMPENSATOR (SVC) AND APPLICATIONS

UNIT III THYRISTOR CONTROLLED SERIES CAPACITOR (TCSC) AND APPLICATIONS

UNIT IV VOLTAGE SOURCE CONVERTER BASED FACTS CONTROLLERS

UNIT V CO-ORDINATION OF FACTS CONTROLLERS
OUTCOMES:
- Ability to understand and analyze power system operation, stability, control and protection.

TEXT BOOKS:

REFERENCES:
arresters - protection of transformers and cables. An introduction to computer analysis tools for transients, PSCAD and EMTP.

UNIT IV HARMONICS

UNIT V POWER QUALITY MONITORING
Monitoring considerations - monitoring and diagnostic techniques for various power quality problems - modeling of power quality (harmonics and voltage sag) problems by mathematical simulation tools - power line disturbance analyzer – quality measurement equipment - harmonic / spectrum analyzer - flicker meters - disturbance analyzer. Applications of expert systems for power quality monitoring.

TOTAL : 45 PERIODS

OUTCOMES:
• Ability to understand and analyze power system operation, stability, control and protection.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To expose the students to the concepts of feed forward neural networks.
- To provide adequate knowledge about feedback neural networks.
- To provide adequate knowledge about fuzzy and neuro-fuzzy systems.
- To provide comprehensive knowledge of fuzzy logic control to real-time systems.
- To provide adequate knowledge of genetic algorithms and its application to economic dispatch and unit commitment problems.

UNIT I ARCHITECTURES – ANN

UNIT II NEURAL NETWORKS FOR CONTROL

UNIT III FUZZY SYSTEMS

UNIT IV APPLICATION OF FUZZY LOGIC SYSTEMS
Fuzzy logic control: Home heating system - liquid level control - aircraft landing- inverted pendulum – fuzzy PID control, Fuzzy based motor control.

UNIT V GENETIC ALGORITHMS

OUTCOMES:
- Ability to understand and apply basic science, circuit theory, Electro-magnetic field theory control theory and apply them to electrical engineering problems.
- To understand and apply computing platform and software for engineering problems.

TEXT BOOKS:

REFERENCES:

GE6081 FUNDAMENTALS OF NANOSCIENCE

L T P C 3 0 0 3

OBJECTIVES:
To learn about basis of nanomaterial science, preparation method, types and application

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

UNIT II GENERAL METHODS OF PREPARATION
Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III NANOMATERIALS

UNIT IV CHARACTERIZATION TECHNIQUES

UNIT V APPLICATIONS

TOTAL : 45 PERIODS

OUTCOMES:
• Will familiarize about the science of nanomaterials
• Will demonstrate the preparation of nanomaterials
• Will develop knowledge in characteristic nanomaterial

**TEXT BOOKS:**

**REFERENCES:**

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**IC6002**

**SYSTEM IDENTIFICATION AND ADAPTIVE CONTROL**

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**OBJECTIVES:**
- To introduce Non parametric methods
- To impart knowledge on parameter estimation methods
- To impart knowledge on Recursive identification methods
- To impart knowledge on Adaptive control schemes
- To introduce stability, Robustness and Applications of adaptive control method

**UNIT I**

**NON PARAMETRIC METHODS**
Non parametric methods: Transient analysis–frequency analysis–Correlation analysis–Spectral analysis.

**UNIT II**

**PARAMETER ESTIMATION METHODS**

**UNIT III**

**RECURSIVE IDENTIFICATION METHODS**

**UNIT IV**

**ADAPTIVE CONTROL SCHEMES**

**UNIT V**

**ISSUES INADAPTIVE CONTROL AND APPLICATIONS**
Stability – Convergence – Robustness –Applications of adaptive control.

**TOTAL: 45 PERIODS**
OUTCOMES:
- Ability to apply advanced control theory to practical engineering problems.

TEXT BOOKS:

REFERENCES:

EE6007 MICRO ELECTRO MECHANICAL SYSTEMS

OBJECTIVES:
- To provide knowledge of semiconductors and solid mechanics to fabricate MEMS devices.
- To educate on the rudiments of Micro fabrication techniques.
- To introduce various sensors and actuators
- To introduce different materials used for MEMS
- To educate on the applications of MEMS to disciplines beyond Electrical and Mechanical engineering.

UNIT I INTRODUCTION

UNIT II SENSORS AND ACTUATORS-I

UNIT III SENSORS AND ACTUATORS-II

UNIT IV MICROMACHINING
Silicon Anisotropic Etching – Anisotrophic Wet Etching – Dry Etching of Silicon – Plasma Etching – Deep Reaction Ion Etching (DRIE) – Isotropic Wet Etching – Gas Phase Etchants – Case studies -

UNIT V POLYMER AND OPTICAL MEMS

Polymers in MEMS- Polimide - SU-8 - Liquid Crystal Polymer (LCP) – PDMS – PMMA – Parylene – Fluorocarbon - Application to Acceleration, Pressure, Flow and Tactile sensors- Optical MEMS – Lenses and Mirrors – Actuators for Active Optical MEMS.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand the operation of micro devices, micro systems and their applications.
- Ability to design the micro devices, micro systems using the MEMS fabrication process.

TEXT BOOKS:


REFERENCES:


EE6008 MICROCONTROLLER BASED SYSTEM DESIGN

OBJECTIVES:

- To introduce the architecture of PIC microcontroller
- To educate on use of interrupts and timers
- To educate on the peripheral devices for data communication and transfer
- To introduce the functional blocks of ARM processor
- To educate on the architecture of ARM processors

UNIT I INTRODUCTION TO PIC MICROCONTROLLER


UNIT II INTERRUPTS AND TIMER

UNIT III  PERIPHERALS AND INTERFACING  

UNIT IV  INTRODUCTION TO ARM PROCESSOR  

UNIT V  ARM ORGANIZATION  

OUTCOMES:  
- To understand and apply computing platform and software for engineering problems.  
- To understand ethical issues, environmental impact and acquire management skills.

TEXT BOOKS:  

REFERENCE:  

EE6009  POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS  
OBJECTIVES:  
- To Provide knowledge about the stand alone and grid connected renewable energy systems.  
- To equip with required skills to derive the criteria for the design of power converters for renewable energy applications.  
- To analyse and comprehend the various operating modes of wind electrical generators and solar energy systems.  
- To design different power converters namely AC to DC, DC to DC and AC to AC converters for renewable energy systems.  
- To develop maximum power point tracking algorithms.

UNIT I  INTRODUCTION  
Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment (cost-GHG Emission) - Qualitative study of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems.
UNIT II  ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION  9
Reference theory fundamentals-principle of operation and analysis: IG, PMSG, SCIG and DFIG.

UNIT III  POWER CONVERTERS  9
Solar: Block diagram of solar photo voltaic system -Principle of operation: line commutated converters (inversion-mode) - Boost and buck-boost converters- selection of inverter, battery sizing, array sizing
Wind: Three phase AC voltage controllers- AC-DC-AC converters: uncontrolled rectifiers, PWM Inverters, Grid Interactive Inverters-matrix converters.

UNIT IV  ANALYSIS OF WIND AND PV SYSTEMS  9
Stand alone operation of fixed and variable speed wind energy conversion systems and solar system
Grid connection Issues -Grid integrated PMSG, SCIG Based WECS, grid Integrated solar system

UNIT V  HYBRID RENEWABLE ENERGY SYSTEMS  9
Need for Hybrid Systems- Range and type of Hybrid systems- Case studies of Wind-PV Maximum Power Point Tracking (MPPT).

TOTAL : 45 PERIODS

OUTCOMES:
• Ability to understand and analyze power system operation, stability, control and protection.
• Ability to handle the engineering aspects of electrical energy generation and utilization.

TEXT BOOK:

REFERENCES:
OBJECTIVES:
- To understand the concept, planning of DC power transmission and comparison with AC Power transmission.
- To analyze HVDC converters.
- To study about the HVDC system control.
- To analyze harmonics and design of filters.
- To model and analysis the DC system under study state.

UNIT I INTRODUCTION
9
DC Power transmission technology – Comparison of AC and DC transmission – Application of DC transmission – Description of DC transmission system – Planning for HVDC transmission – Modern trends in HVDC technology – DC breakers – Operating problems – HVDC transmission based on VSC – Types and applications of MTDC systems.

UNIT II ANALYSIS OF HVDC CONVERTERS
9
Line commutated converter - Analysis of Graetz circuit with and without overlap - Pulse number – Choice of converter configuration – Converter bridge characteristics – Analysis of a 12 pulse converters – Analysis of VSC topologies and firing schemes.

UNIT III CONVERTER AND HVDC SYSTEM CONTROL
9
Principles of DC link control – Converter control characteristics – System control hierarchy – Firing angle control – Current and extinction angle control – Starting and stopping of DC link – Power control – Higher level controllers – Control of VSC based HVDC link.

UNIT IV REACTIVE POWER AND HARMONICS CONTROL
9
Reactive power requirements in steady state – Sources of reactive power – SVC and STATCOM – Generation of harmonics – Design of AC and DC filters – Active filters.

UNIT V POWER FLOW ANALYSIS IN AC/DC SYSTEMS
9
Per unit system for DC quantities – DC system model – Inclusion of constraints – Power flow analysis – case study.

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to understand and analyze power system operation, stability, control and protection.

TEXT BOOKS:

REFERENCES:

EE6011 POWER SYSTEM DYNAMICS

OBJECTIVES:
- To introduce the basics of dynamics and stability problems
- To educate on modeling of synchronous machines
- To educate on the excitation system and speed-governing controllers.
- To study small signal stability of a single-machine infinite bus system with excitation system and power system stabilizer.
- To educate on the transient stability simulation of multi machine power system.

UNIT I INTRODUCTION
Basics of system dynamics – numerical techniques – introduction to software packages to study the responses. Concept and importance of power system stability in the operation and design - distinction between transient and dynamic stability - complexity of stability problem in large system – necessity for reduced models - stability of interconnected systems.

UNIT II SYNCHRONOUS MACHINE MODELLING
Synchronous machine - flux linkage equations - Park’s transformation - per unit conversion - normalizing the equations - equivalent circuit - current space model - flux linkage state space model. Sub-transient and transient inductances - time constants. Simplified models (one axis and constant flux linkage) - steady state equations and phasor diagrams.

UNIT III MACHINE CONTROLLERS
Exciter and voltage regulators - function and types of excitation systems - typical excitation system configuration - block diagram and state space representation of IEEE type 1 excitation system - saturation function - stabilizing circuit. Function of speed governing systems - block diagram and state space representation of IEEE mechanical hydraulic governor and electrical hydraulic governors for hydro turbines and steam turbines.

UNIT IV TRANSIENT STABILITY
State equation for multi machine system with one axis model and simulation – modelling of multi machine power system with one axis machine model including excitation system and speed governing system and simulation using R-K method of fourth order (Gill’s technique) for transient stability analysis - power system stabilizer. For all simulations, the algorithm and flow chart have to be discussed.

UNIT V DYNAMIC STABILITY

TOTAL : 45 PERIODS
OUTCOMES:
- Ability to understand and analyze power system operation, stability, control and protection.

TEXT BOOKS:

REFERENCES:

IC6003 PRINCIPLES OF ROBOTICS

OBJECTIVES:
- To introduce the functional elements of Robotics
- To impart knowledge on the direct and inverse kinematics
- To introduce the manipulator differential motion and control
- To educate on various path planning techniques
- To introduce the dynamics and control of manipulators

UNIT I  BASIC CONCEPTS 9

UNIT II  DIRECT AND INVERSE KINEMATICS 9

UNIT III  MANIPULATOR DIFFERENTIAL MOTION AND STATICS 9
Linear and angular velocities-Manipulator Jacobian-Prismatic and rotary joints–Inverse -Wrist and arm singularity - Static analysis - Force and moment Balance.

UNIT IV  PATH PLANNING 9
Definition-Joint space technique-Use of p-degree polynomial-Cubic polynomial-Cartesian space technique - Parametric descriptions - Straight line and circular paths - Position and orientation planning.
UNIT V DYNAMICS AND CONTROL

Lagrangian mechanics-2DOF Manipulator-Lagrange Euler formulation-Dynamic model -Manipulator control problem-Linear control schemes-PID control scheme-Force control of robotic manipulator.

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to understand and analyze Instrumentation systems and their applications to various industries.

TEXT BOOKS:

REFERENCES:

GE6075 PROFESSIONAL ETHICS IN ENGINEERING

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

UNIT II ENGINEERING ETHICS
UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS

UNIT V GLOBAL ISSUES

TOTAL: 45 PERIODS

OUTCOMES:
- 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.

TEXT BOOKS:

REFERENCES:

Web sources:
1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org
OBJECTIVES:
- To facilitate the understanding of Quality Management principles and process.

UNIT I INTRODUCTION

UNIT II TQM PRINCIPLES
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
The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Benchmarking - Reason to benchmark, Bench marking process - FMEA - Stages, Types.

UNIT IV TQM TOOLS AND TECHNIQUES II

UNIT V QUALITY SYSTEMS

TOTAL: 45 PERIODS

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

TEXT BOOK:

REFERENCES:
OBJECTIVES:
- To bring out the concepts related to stationary and non-stationary random signals
- To emphasize the importance of true estimation of power spectral density
- To introduce the design of linear and adaptive systems for filtering and linear prediction
- To introduce the concept of wavelet transforms in the context of image processing

UNIT I  DISCRETE-TIME RANDOM SIGNALS

UNIT II  SPECTRUM ESTIMATION
Bias and Consistency, Periodogram, Modified periodogram, Blackman-Tukey method, Welch method, Parametric methods of spectral estimation, Levinson-Durbin recursion.

UNIT III  LINEAR ESTIMATION AND PREDICTION
Forward and Backward linear prediction, Filtering - FIR Wiener filter- Filtering and linear prediction, non-causal and causal IIR Wiener filters, Discrete Kalman filter.

UNIT IV  ADAPTIVE FILTERS

UNIT V  WAVELET TRANSFORM
Multiresolution analysis, Continuous and discrete wavelet transform, Short Time Fourier Transform, Application of wavelet transform, Cepstrum and Homomorphic filtering.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, students will be able to:
- Explain the parametric methods for power spectrum estimation.
- Discuss adaptive filtering techniques using LMS algorithm and the applications of adaptive filtering.
- Analyze the wavelet transforms.

TEXT BOOKS:

REFERENCE:
OBJECTIVES:
- To introduce the importance of computer aided design method.
- To provide basic electromagnetic field equations and the problem formulation for CAD applications.
- To get familiarized with Finite Element Method as applicable for Electrical Engineering.
- To introduce the organization of a typical CAD package.
- To introduce Finite Element Method for the design of different Electrical apparatus.

UNIT I  INTRODUCTION
Conventional design procedures – Limitations – Need for field analysis based design – Review of Basic principles of energy conversion – Development of Torque/Force.

UNIT II  MATHEMATICAL FORMULATION OF FIELD PROBLEMS

UNIT III  PHILOSOPHY OF FEM

UNIT IV  CAD PACKAGES

UNIT V  DESIGN APPLICATIONS

TOTAL : 45 PERIODS

OUTCOMES:
- Ability to model and analyze electrical apparatus and their application to power system.

TEXT BOOKS:

REFERENCES:
5. User Manuals of MAGNET, MAXWELL & ANSYS Softwares.
OBJECTIVES:
- In this course, the MOS circuit realization of the various building blocks that is common to any microprocessor or digital VLSI circuit is studied.
- Architectural choices and performance tradeoffs involved in designing and realizing the circuits in CMOS technology are discussed.
- The main focus in this course is on the transistor circuit level design and realization for digital operation and the issues involved as well as the topics covered are quite distinct from those encountered in courses on CMOS Analog IC design.

UNIT I MOS TRANSISTOR PRINCIPLE
NMOS and PMOS transistors, Process parameters for MOS and CMOS, Electrical properties of CMOS circuits and device modeling, Scaling principles and fundamental limits, CMOS inverter scaling, propagation delays, Stick diagram, Layout diagrams

UNIT II COMBINATIONAL LOGIC CIRCUITS
Examples of Combinational Logic Design, Elmore’s constant, Pass transistor Logic, Transmission gates, static and dynamic CMOS design, Power dissipation – Low power design principles

UNIT III SEQUENTIAL LOGIC CIRCUITS
Static and Dynamic Latches and Registers, Timing issues, pipelines, clock strategies, Memory architecture and memory control circuits, Low power memory circuits, Synchronous and Asynchronous design

UNIT IV DESIGNING ARITHMETIC BUILDING BLOCKS
Data path circuits, Architectures for ripple carry adders, carry look ahead adders, High speed adders, accumulators, Multipliers, dividers, Barrel shifters, speed and area tradeoff

UNIT V IMPLEMENTATION STRATEGIES
Full custom and Semi custom design, Standard cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, students should
- Explain the basic CMOS circuits and the CMOS process technology.
- Discuss the techniques of chip design using programmable devices.
- Model the digital system using Hardware Description Language.

TEXTBOOKS:

REFERENCES:
AFFILIATED INSTITUTIONS
ANNA UNIVERSITY: : CHENNAI 600 025

REGULATIONS - 2013

I TO IV SEMESTERS (FULL TIME) CURRICULUM AND SYLLABUS

MASTER OF BUSINESS ADMINISTRATION (MBA)

SEMMESTER – I

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SUMMER SEMESTER (4 WEEKS)

SUMMER TRAINING

Summer Training – The training report along with the company certificate should be submitted within the two weeks of the reopening date of 3rd semester. The training report should be around 40 pages containing the details of training undergone, the departments wherein he was trained with duration (chronological diary), along with the type of managerial skills developed during training. The training report should be sent to the Controller of Examinations by the HOD through the Principal, before the last working day of the 3rd Semester.
## SEMESTER – III

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**TOTAL NUMBER OF CREDITS = 96**
# AFFILIATED INSTITUTIONS
### ANNA UNIVERSITY CHENNAI : : CHENNAI 600 025
### REGULATIONS - 2013
### CURRICULUM I TO VI SEMESTERS (PART TIME)
### MASTER OF BUSINESS ADMINISTRATION (MBA)

## SEMESTER – I

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SUMMER SEMESTER (4 WEEKS)

SUMMER TRAINING

Summer Training – Chronological Diary needs to be maintained and submitted within the first week of the reopening date of 5th semester. The training report along with the company certificate should be sent to the Controller of Examinations by the HOD through the Principal, before the last working day of the 5th Semester.

SEMESTER – V

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**TOTAL NUMBER OF CREDITS = 96**
# LIST OF ELECTIVES

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Note: Three electives from two specializations from among the 5 areas of specialization are to be chosen by the students
COURSE OBJECTIVE:
To expose the students to the basic concepts of management in order to aid in understanding how an organization functions, and in understanding the complexity and wide variety of issues managers face in today’s business firms.

COURSE OUTCOME:
The students should be able to describe and discuss the elements of effective management, ii) discuss and apply the planning, organizing and control processes, iii) describe various theories related to the development of leadership skills, motivation techniques, team work and effective communication, iv) communicate effectively through both oral and written presentation.

UNIT I  INTRODUCTION TO MANAGEMENT  9

UNIT II  PLANNING  9

UNIT III  ORGANISING  9
Nature and purpose of organizing - Organization structure - Formal and informal groups/organization - Line and staff authority - Departmentation - Span of control - Centralization and decentralization - Delegation of authority - Staffing - Selection and Recruitment - Orientation - Career development - Career stages - Training - Performance appraisal

UNIT IV  DIRECTING  9
Managing people - Communication - Hurdles to effective communication - Organization culture - Elements and types of culture - Managing cultural diversity.

UNIT V  CONTROLLING  9
Process of controlling - Types of control - Budgetary and non-budgetary control techniques - Managing productivity - Cost control - Purchase control - Maintenance control - Quality control - Planning operations.

TEXT BOOKS:
REFERENCES:

BA7102 STATISTICS FOR MANAGEMENT LT P C 3 1 0 4

COURSE OBJECTIVE:
To learn the applications of statistics in business decision making.

COURSE OUTCOME:
To facilitate objective solutions in business decision making under subjective conditions

UNIT I INTRODUCTION

UNIT II SAMPLING DISTRIBUTION AND ESTIMATION
Introduction to sampling distributions, sampling distribution of mean and proportion, application of central limit theorem, sampling techniques. Estimation: Point and Interval estimates for population parameters of large sample and small samples, determining the sample size.

UNIT III TESTING OF HYPOTHESIS - PARAMETRIC TESTS
Hypothesis testing: one sample and two sample tests for means and proportions of large samples (z-test), one sample and two sample tests for means of small samples (t-test), F-test for two sample standard deviations. ANOVA one and two way.

UNIT IV NON-PARAMETRIC TESTS

UNIT V CORRELATION, REGRESSION AND TIME SERIES ANALYSIS
Correlation analysis, estimation of regression line. Time series analysis: Variations in time series, trend analysis, cyclical variations, seasonal variations and irregular variations, forecasting errors.

TEXTBOOKS:
REFERENCES:

BA7103 ECONOMIC ANALYSIS FOR BUSINESS LT P C 4 0 0 4

COURSE OBJECTIVE:
To introduce the concepts of scarcity and efficiency; to explain principles of micro economics relevant to managing an organization; to describe principles of macro economics to have the understanding of economic environment of business.

COURSE OUTCOME:
Students are expected to become familiar with both principles of micro and macro economics. They would also become familiar with application of these principles to appreciate the functioning of both product and input markets as well as the economy.

UNIT I INTRODUCTION 8

UNIT II CONSUMER AND PRODUCER BEHAVIOUR 13

UNIT III PRODUCT AND FACTOR MARKET 13

UNIT IV PERFORMANCE OF AN ECONOMY – MACRO ECONOMICS 13

UNIT V AGGREGATE SUPPLY AND THE ROLE OF MONEY 13
market- Demand and supply of money – money-market equilibrium and national income – the role of monetary policy.

**TEXTBOOKS**

**BA7104 TOTAL QUALITY MANAGEMENT**  
**COURSE OBJECTIVE:**
To learn the quality philosophies and tools in the managerial perspective.

**COURSE OUTCOME:**
To apply quality philosophies and tools to facilitate continuous improvement and ensure customer delight.

**UNIT I  INTRODUCTION**  

**UNIT II  PRINCIPLES AND PHILOSOPHIES OF QUALITY MANAGEMENT**  

**UNIT III  STATISTICAL PROCESS CONTROL**  

**UNIT IV  TOOLS AND TECHNIQUES FOR QUALITY MANAGEMENT**  
Quality functions development (QFD) – Benefits, Voice of customer, information organization, House of quality (HOQ), building a HOQ, QFD process. Failure mode effect analysis (FMEA) – requirements of reliability, failure rate, FMEA stages, design, process and documentation. Seven Tools (old & new). Bench marking and POKA YOKE.
UNIT V QUALITY SYSTEMS ORGANIZING AND IMPLEMENTATION


TOTAL: 45 PERIODS

TEXTBOOKS

REFERENCES
4. Indian standard – quality management systems – Guidelines for performance improvement (Fifth Revision), Bureau of Indian standards, New Delhi
COURSE OBJECTIVE:
To provide an overview of theories and practices in organizational behavior in individual, group and organizational level.

COURSE OUTCOME:
Students will have a better understanding of human behavior in organization. They will know the framework for managing individual and group performance.

UNIT I FOCUS AND PURPOSE 5

UNIT II INDIVIDUAL BEHAVIOUR 12
Misbehaviour – Types – Management Intervention.
Emotions - Emotional Labour – Emotional Intelligence – Theories.
Motivation – Importance – Types – Effects on work behavior.

UNIT III GROUP BEHAVIOUR 10
Organization structure – Formation – Groups in organizations – Influence – Group dynamics – Emergence of informal leaders and working norms – Group decision making techniques – Team building - Interpersonal relations – Communication – Control.

UNIT IV LEADERSHIP AND POWER 8

UNIT V DYNAMICS OF ORGANIZATIONAL BEHAVIOUR 10

TOTAL: 45 PERIODS

TEXTBOOKS

REFERENCES
COURSE OBJECTIVE:
- Acquire a reasonable knowledge in accounts
- Analysis and evaluate financial statements

COURSE OUTCOME
- Possess a managerial outlook at accounts.

UNIT I  FINANCIAL ACCOUNTING  12

UNIT II  COMPANY ACCOUNTS  12
Meaning of Company -Maintenance of Books of Account-Statutory Books- Profit or Loss Prior to incorporation- Final Accounts of Company- Alteration of share capital- Preferential allotment, Employees stock option- Buy back of securities.

UNIT III ANALYSIS OF FINANCIAL STATEMENTS  12
Analysis of financial statements – Financial ratio analysis, cash flow (as per Accounting Standard 3) and funds flow statement analysis.

UNIT IV  COST ACCOUNTING  12

UNIT V  ACCOUNTING IN COMPUTERISED ENVIRONMENT  12
Significance of Computerised Accounting System- Codification and Grouping of Accounts-Maintaining the hierarchy of ledgers- Prepackaged Accounting software.

TOTAL: 45+15 = 60 PERIODS

TEXTBOOKS

REFERENCES
COURSE OBJECTIVE:
To create the knowledge of Legal perspective and its practices to improvise the business.

COURSE OUTCOME:
Legal insight will be established in the business practices according to the situation of changing environment.

UNIT I COMMERCIAL LAW
THE INDIAN CONTRACT ACT 1872

THE SALE OF GOODS ACT 1930

UNIT II COMPANY LAW
Major principles – Nature and types of companies, Formation, Memorandum and Articles of Association, Prospectus, Power, duties and liabilities of Directors, winding up of companies, Corporate Governance.

UNIT III INDUSTRIAL LAW

UNIT IV INCOME TAX ACT AND SALES TAX ACT

UNIT - V CONSUMER PROTECTION ACT AND INTRODUCTION OF CYBER LAWS

TOTAL: 45 PERIODS

TEXTBOOKS

REFERENCES
2. Dr. Vinod, K. Singhania, Direct Taxes Planning and Management, 2008.
COURSE OBJECTIVE:
To familiarize learners with the mechanics of writing.
To enable learners to write in English precisely and effectively.

COURSE OUTCOME:
Learners should be able to
i) get into the habit of writing regularly,
ii) express themselves in different genres of writing from creative to critical to factual writing,
iii) take part in print and online media communication,
iv) read quite widely to acquire a style of writing, and
v) identify their areas of strengths and weaknesses in writing.

UNIT I PERSONAL COMMUNICATION
9
Journal writing, mails/emails, SMS, greeting cards, situation based – accepting/declining invitations, congratulating, consoling, conveying information.

UNIT II SOCIAL COMMUNICATION
9
Blogs, Reviews (films, books), posting comments, tweets, cross-cultural communication, gender sensitivity in communication.

UNIT III WORK PLACE COMMUNICATION
9
e-mails, minutes, reports of different kinds – annual report, status report, survey report, proposals, memorandums, presentations, interviews, profile of institutions, speeches, responding to enquiries, complaints, resumes, applications, summarizing, strategies for writing.

UNIT IV RESEARCH WRITING
9
Articles for publication (Journals), developing questionnaire, writing abstract, dissertation, qualities of research writing, data (charts, tables) analysis, documentation.

UNIT V WRITING FOR MEDIA AND CREATIVE WRITING
9
Features for publication (Newspapers, magazines, newsletters, notice-board), case studies, short stories, travelogues, writing for children, translation, techniques of writing

TOTAL: 45 PERIODS

TEXTBOOKS

REFERENCE:

Management books
Robin Sharma - The greatness guide
Steven Covey - 7 Habits of Effective people
Arindham Chaudhuri - Count your chickens before they hatch
Ramadurai - TCS Story
BA7201  OPERATIONS MANAGEMENT  LT P C 3 0 0 3

COURSE OBJECTIVE:
To provide a broad introduction to the field of operations management and explain the concepts, strategies, tools and techniques for managing the transformation process that can lead to competitive advantage.

COURSE OUTCOME:
Understanding of the strategic and operational decisions in managing manufacturing and service organizations and appreciation of the role of operations management function in an organization.

UNIT I  INTRODUCTION TO OPERATIONS MANAGEMENT  9
Operations Management – Nature, Importance, historical development, transformation processes, differences between services and goods, a system perspective, functions, challenges, current priorities, recent trends; Operations Strategy – Strategic fit, framework; Supply Chain Management

UNIT II  FORECASTING, CAPACITY AND FACILITY DESIGN  9

UNIT III  DESIGN OF PRODUCT, PROCESS AND WORK SYSTEMS  9

UNIT IV  MATERIALS MANAGEMENT  9

UNIT V  SCHEDULING AND PROJECT MANAGEMENT  9
Project Management – Scheduling Techniques, PERT, CPM; Scheduling - work centers – nature, importance; Priority rules and techniques, shopfloor control; Flow shop scheduling – Johnson’s Algorithm – Gantt charts; personnel scheduling in services.

TOTAL: 45 PERIODS

TEXTBOOKS
REFERENCES

BA7202 FINANCIAL MANAGEMENT LT P C
3 0 0 3

COURSE OBJECTIVES:
Facilitate student to
- Understand the operational nuances of a Finance Manager
- Comprehend the technique of making decisions related to finance function

COURSE OUTCOME:
Possess the techniques of managing finance in an organization

UNIT I FOUNDATIONS OF FINANCE: 9
Financial management – An overview- Time value of money- Introduction to the concept of risk and return of a single asset and of a portfolio- Valuation of bonds and shares-Option valuation.

UNIT II INVESTMENT DECISIONS: 9
Capital Budgeting: Principles and techniques - Nature of capital budgeting- Identifying relevant cash flows - Evaluation Techniques: Payback, Accounting rate of return, Net Present Value, Internal Rate of Return, Profitability Index - Comparison of DCF techniques - Project selection under capital rationing - Inflation and capital budgeting - Concept and measurement of cost of capital - Specific cost and overall cost of capital

UNIT III FINANCING AND DIVIDEND DECISION: 9
Financial and operating leverage - capital structure - Cost of capital and valuation - designing capital structure.
Dividend policy - Aspects of dividend policy - practical consideration - forms of dividend policy - forms of dividends - share splits.

UNIT IV WORKING CAPITAL MANAGEMENT: 9

UNIT V LONG TERM SOURCES OF FINANCE: 9
Indian capital and stock market, New issues market Long term finance: Shares, debentures and term loans, lease, hire purchase, venture capital financing, Private Equity.
TEXTBOOKS

REFERENCES

BA7203 MARKETING MANAGEMENT LT P C 4 0 0 4

COURSE OBJECTIVE:
To understand the changing business environment
To identify the indicators of management thoughts and practices
to understand fundamental premise underlying market driven strategies

COURSE OUT COME:
• knowledge of analytical skills in solving marketing related problems
• awareness of marketing management process

UNIT I INTRODUCTION 12
Marketing – Definitions - Conceptual frame work – Marketing environment : Internal and External -

UNIT II MARKETING STRATEGY 12
Marketing strategy formulations – Key Drivers of Marketing Strategies - Strategies for Industrial Marketing – Consumer Marketing — Services marketing – Competitor analysis - Analysis of consumer and industrial markets – Strategic Marketing Mix components.

UNIT III MARKETING MIX DECISIONS 12
Advertising and sales promotions – Pricing Objectives, Policies and methods.

UNIT IV BUYER BEHAVIOUR 12
Understanding industrial and individual buyer behavior - Influencing factors – Buyer Behaviour Models – Online buyer behaviour - Building and measuring customer satisfaction – Customer relationships management – Customer acquisition, Retaining, Defection.

UNIT V MARKETING RESEARCH & TRENDS IN MARKETING 12
Advertising – Promotion – Consumer Behaviour – Retail research – Customer driven organizations - Cause related marketing - Ethics in marketing –Online marketing trends.
TEXT BOOKS

REFERENCES
COURSE OBJECTIVE:
To provide knowledge about management issues related to staffing, training, performance, compensation, human factors consideration and compliance with human resource requirements.

COURSE OUTCOME:
Students will gain knowledge and skills needed for success as a human resources professional.

UNIT I PERSPECTIVES IN HUMAN RESOURCE MANAGEMENT 5

UNIT II THE CONCEPT OF BEST FIT EMPLOYEE 8

UNIT III TRAINING AND EXECUTIVE DEVELOPMENT 10

UNIT IV SUSTAINING EMPLOYEE INTEREST 12

UNIT V PERFORMANCE EVALUATION AND CONTROL PROCESS 10

TEXTBOOK

REFERENCES
COURSE OBJECTIVE

- To understand the importance of information in business
- To know the technologies and methods used for effective decision making in an organization.

COURSE OUTCOME

- Gains knowledge on effective applications of information systems in business

UNIT I  INTRODUCTION


UNIT II  SYSTEM ANALYSIS AND DESIGN

Case tools - System flow chart, Decision table, Data flow Diagram (DFD), Entity Relationship (ER), Object Oriented Analysis and Design (OOAD), UML diagram.

UNIT III  DATABASE MANAGEMENT SYSTEMS

DBMS – HDBMS, NDBMS, RDBMS, OODBMS, Query Processing, SQL, Concurrency Management, Data warehousing and Data Mart.

UNIT IV  SECURITY, CONTROL AND REPORTING


UNIT V  NEW IT INITIATIVES

Role of information management in ERP, e-business, e-governance, Data Mining, Business Intelligence, Pervasive Computing, Cloud computing, CMM.

TOTAL: 45 PERIODS

TEXTBOOKS


REFERENCES


BA7206 APPLIED OPERATIONS RESEARCH

COURSE OBJECTIVE:
To learn the concepts of operations research applied in business decision making.

COURSE OUTCOME:
To facilitate quantitative solutions in business decision making under conditions of certainty, risk and uncertainty.

UNIT I INTRODUCTION TO LINEAR PROGRAMMING (LP) 12
Introduction to applications of operations research in functional areas of management. Linear Programming-formulation, solution by graphical and simplex methods (Primal - Penalty, Two Phase), Special cases. Dual simplex method. Principles of Duality. Sensitivity Analysis.

UNIT II LINEAR PROGRAMMING EXTENSIONS 12

UNIT III INTEGER PROGRAMMING AND GAME THEORY 12
Solution to pure and mixed integer programming problem by Branch and Bound and cutting plane algorithms. Game Theory-Two person Zero sum games-Saddle point, Dominance Rule, Convex Linear Combination (Averages), methods of matrices, graphical and LP solutions.

UNIT IV INVENTORY MODELS, SIMULATION AND DECISION THEORY 12

UNIT V QUEUING THEORY AND REPLACEMENT MODELS 12
Queueing Theory - single and Multi-channel models – infinite number of customers and infinite calling source. Replacement Models-Individuals replacement Models (With and without time value of money) – Group Replacement Models.

TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES

BA7207 BUSINESS RESEARCH METHODS

LT P C
3 0 0 3

COURSE OBJECTIVE:
To expose the students to the principles of scientific methodology in business enquiry; to develop analytical skills of business research; to develop the skills for scientific communications.

COURSE OUTCOME:
Students would become acquainted with the scientific methodology in business domain. They would also become analytically skillful. They would become familiar with the nuances of scientific communications.

UNIT I INTRODUCTION

UNIT II RESEARCH DESIGN AND MEASUREMENT

UNIT III DATA COLLECTION

UNIT IV DATA PREPARATION AND ANALYSIS

UNIT V REPORT DESIGN, WRITING AND ETHICS IN BUSINESS RESEARCH

TOTAL: 45 PERIODS
TEXT BOOKS

BA7211 DATA ANALYSIS AND BUSINESS MODELING

COURSE OBJECTIVE
- to have hands-on experience on decision modeling

COURSE OUTCOME
- Knowledge of spreadsheets and data analysis software for business modeling

[Business models studied in theory to be practiced using Spreadsheet / Analysis Software]

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Exp. No.</th>
<th>Details of experiments Name</th>
<th>Duration</th>
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<tr>
<td>1</td>
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<td>Descriptive Statistics</td>
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<td>Hypothesis - Parametric</td>
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<td>Hypothesis – Non-parametric</td>
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<td>Correlation &amp; Regression</td>
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<td>Portfolio Selection</td>
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<td>Risk Analysis &amp; Sensitivity Analysis</td>
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<td>8</td>
<td>Revenue Management</td>
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<td>Extended experiment – 2</td>
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<td>Transportation &amp; Assignment</td>
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<td>12</td>
<td>10</td>
<td>Networking Models</td>
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<td>Queuing Theory</td>
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<td>14</td>
<td>12</td>
<td>Inventory Models</td>
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<td>15</td>
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<td>Extended experiments – 3</td>
<td>4</td>
</tr>
</tbody>
</table>

- Spreadsheet Software and
- Data Analysis Tools

TOTAL: 60 PERIODS

REQUIREMENTS for a batch of 30 students
1. Personal Computers – 30 nos
2. Any licensed Spreadsheet and Analysis software like Microsoft Excel, SPSS etc– 30 user licenses
TEXT BOOKS
5. Vikas Gupta, Comdex Business Accounting with Ms Excel, 2010 and Tally ERP 9.0 Course Kit, Wiley India, 2012.

<table>
<thead>
<tr>
<th>BA7301</th>
<th>ENTERPRISE RESOURCE PLANNING</th>
<th>LT P C</th>
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<tbody>
<tr>
<td></td>
<td>COURSE OBJECTIVES</td>
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<tr>
<td></td>
<td>to understand the business process of an enterprise</td>
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<td></td>
<td>to grasp the activities of ERP project management cycle</td>
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<td></td>
<td>to understand the emerging trends in ERP developments</td>
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<td></td>
<td>COURSE OUTCOMES</td>
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<tr>
<td></td>
<td>knowledge of ERP implementation cycle</td>
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<td></td>
<td>awareness of core and extended modules of ERP</td>
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<tr>
<td>UNIT I</td>
<td>INTRODUCTION</td>
<td>8</td>
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<tr>
<td>Overview of enterprise systems – Evolution - Risks and benefits - Fundamental technology - Issues to be consider in planning design and implementation of cross functional integrated ERP systems.</td>
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<td>UNIT II</td>
<td>ERP SOLUTIONS AND FUNCTIONAL MODULES</td>
<td>10</td>
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<tr>
<td>Overview of ERP software solutions- Small, medium and large enterprise vendor solutions, BPR, and best business practices - Business process Management, Functional modules.</td>
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<tr>
<td>UNIT III</td>
<td>ERP IMPLEMENTATION</td>
<td>10</td>
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<td>UNIT IV</td>
<td>POST IMPLEMENTATION</td>
<td>8</td>
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<tr>
<td>Maintenance of ERP- Organizational and Industrial impact; Success and Failure factors of ERP Implementation.</td>
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<tr>
<td>UNIT V</td>
<td>EMERGING TRENDS ON ERP</td>
<td>9</td>
</tr>
</tbody>
</table>

TOTAL: 45 PERIODS

TEXT BOOK
REFERENCES
4. Mahadeo Jaiswal and Ganesh Vanapalli, ERP Macmillan India, 2009

BA7302 STRATEGIC MANAGEMENT LT P C
3 0 0 3

COURSE OBJECTIVE:
To learn the major initiatives taken by a company's top management on behalf of corporates, involving resources and performance in external environments. It entails specifying the organization's mission, vision and objectives, developing policies and plan to understand the analysis and implementation of strategic management in strategic business units.

COURSE OUTCOME:
This Course will create knowledge and understanding of management concepts principles and skills from a people, finance, marketing and organisational perspectives the development of appropriate organisational policies and strategies within a changing context to meet stakeholder interests information systems to learn from failure key tools and techniques for the analysis and design of information systems, including their human and organisational as well as technical aspects.

UNIT I STRATEGY AND PROCESS 9

UNIT II COMPETITIVE ADVANTAGE 9

UNIT III STRATEGIES 10
UNIT IV STRATEGY IMPLEMENTATION & EVALUATION

The implementation process, Resource allocation, Designing organisational structure-Designing Strategic Control Systems- Matching structure and control to strategy-Implementing Strategic change-Politics-Power and Conflict-Techniques of strategic evaluation & control-case study.

UNIT V OTHER STRATEGIC ISSUES

Managing Technology and Innovation-Strategic issues for Non Profit organisations. New Business Models and strategies for Internet Economy-case study

TOTAL: 45 PERIODS

TEXTBOOKS


REFERENCES

COURSE OBJECTIVE:
To enable learners to speak fluently and flawlessly in all kinds of communicative Contexts with speakers of all nationalities.

COURSE OUTCOMES:
Learners should be able to
I. speak confidently with any speakers of English, including native speakers,
II. speak effortlessly in different contexts – informal and formal,
III. ‘think on feet’ even in difficult circumstances,
IV. hold interesting and meaningful conversations with others, including strangers, and
V. listen to others with utmost attention.

UNIT I PERSONAL COMMUNICATION
Day-to-day conversation with family members, neighbours, relatives, friends on various topics, context specific – agreeing/disagreeing, wishing, consoling, advising, persuading, expressing opinions, arguing.

UNIT II SOCIAL COMMUNICATION
Telephone calls (official), colleagues in the workspot, discussing issues (social, political, cultural) clubs (any social gathering), answering questions, talking about films, books, news items, T.V. programmes, sharing jokes.

UNIT III GROUP/MASS COMMUNICATION
Group discussion (brainstorming), debate, panel discussion, anchoring/master of ceremony, welcome address, proposing vote of thanks, introducing speakers, conducting meetings, making announcements, Just-a-minute (JAM), Block and tackle, shipwreck, spoof, conducting quiz, negotiations, oral reports.

UNIT IV INTEGRATED SPEAKING AND PRESENTATION SKILLS
Listening to speak (any radio programme/lecture), reading to speak, writing to speak, watching to speak, (any interesting programme on TV) Reading aloud any text/speech, lecturing, PowerPoint presentation, impromptu, Interviews of different kinds (one to one, many to one, stress interview, telephonic interview).

UNIT V EMPLOYABILITY AND CORPORATE SKILLS
Interview skills – Types of interview, preparation for interview, mock interview. Group Discussion – Communication skills in Group Discussion, Structure of GD, GD process, successful GD techniques, skills bought out in GD – leadership and co-ordination. Time management and effective planning – identifying barriers to effective time management, prudent time management techniques, relationship between time management and stress management. Stress management – causes and effect, coping strategies – simple physical exercises, simple Yoga and Meditation techniques, Relaxation techniques, stress and faith healing, positive forces of nature, relaxation by silence and music. Decision making and Negotiation skills, People skills, Team work, development of leadership qualities.

TOTAL: 60 PERIODS
Note: Students will undergo the entire programme similar to a Seminar. It is an activity based course. Student individually or as a group can organize event(s), present term papers etc. This will be evaluated by the faculty member(s) handling the course and the consolidated marks can be taken as the final mark. No end semester examination is required for this course.

REFERENCES:
3. Listening to/Watching great speeches such as Barack Obama, M.A. Chidambaram, Vijay Mallaya etc. Tedtalk TV channels (News, documentaries).

BA7401 INTERNATIONAL BUSINESS MANAGEMENT 3 0 0 3

COURSE OBJECTIVE:
To expose the students to the basic concepts of international business management

COURSE OUTCOME:
Students would be familiar with global business environment, global strategic management practices and get acquainted with functional domain practices. They would be familiar with conflicts situations and ethical issues in global business.

UNIT I INTRODUCTION

UNIT II INTERNATIONAL TRADE AND INVESTMENT

UNIT III INTERNATIONAL STRATEGIC MANAGEMENT

UNIT IV PRODUCTION, MARKETING, FINANCIAL AND HUMAN RESOURCE MANAGEMENT OF GLOBAL BUSINESS

UNIT V  CONFLICT MANAGEMENT AND ETHICS IN INTERNATIONAL BUSINESS MANAGEMENT  6
Disadvantages of international business – Conflict in international business - Sources and types of conflict – Conflict resolutions – Negotiation – the role of international agencies – Ethical issues in international business – Ethical decision-making.

TOTAL: 45 PERIODS

TEXT BOOKS

BA7402 BUSINESS ETHICS, CORPORATE SOCIAL RESPONSIBILITY AND GOVERNANCE 3 0 0 3

COURSE OBJECTIVE:
To have grounding on theory through the understanding of real life situations and cases.

COURSE OUTCOME:
To understand ethical issues in workplace and be able to find solution for ‘most good’.

UNIT I  INTRODUCTION  9
Definition & nature Business ethics, Characteristics, Ethical theories; Causes of unethical behavior; Ethical abuses; Work ethics; Code of conduct; Public good.

UNIT II  ETHICS THEORY AND BEYOND  9
Management of Ethics - Ethics analysis [ Hosmer model ]; Ethical dilemma; Ethics in practice - ethics for managers; Role and function of ethical managers- Comparative ethical behaviour of managers; Code of ethics; Competitiveness, organizational size, profitability and ethics; Cost of ethics in Corporate ethics evaluation. Business and ecological / environmental issues in the Indian context and case studies.

UNIT III  LEGAL ASPECTS OF ETHICS  9
Political – legal environment; Provisions of the Indian constitution pertaining to Business; Political setup – major characteristics and their implications for business; Prominent features of MRTP & FERA. Social – cultural environment and their impact on business operations, Salient features of Indian culture and values.
UNIT IV ENVIRONMENTAL ETHICS 9
Economic Environment; Philosophy of economic grow and its implications for business; Main features of Economic Planning with respect to business; Industrial policy and framework of government contract over Business; Role of chamber of commerce and confederation of Indian Industries.

UNIT V CORPORATE SOCIAL RESPONSIBILITY AND GOVERNANCE 9
Definition- Evolution- Need for CSR; Theoretical perspectives; Corporate citizenship: Business practices; Strategies for CSR; Challenges and implementation; Evolution of corporate governance; Governance practices and regulation; Structure and development of boards; Role of capital market and government; Governance ratings; Future of governance- innovative practices; Case studies with lessons learnt.

TOTAL: 45 PERIODS

TEXTBOOKS

REFERENCES
3. Philip Kotler and Nancy Lee, Corporate social responsibility: doing the most good for company and your cause, Wiley, 2005.
5. Satheesh kumar, Corporate governance, Oxford University Press, 2010.
COURSE OBJECTIVES:
(i) To understand the nuances involved in Creativity & Innovation.
(ii) To get hands on experience in applying creativity in problem solving.

COURSE OUTCOMES:
Student will be equipped to apply his/her creative and innovative skills in solving complex problems confronting corporate realm.

UNIT I INTRODUCTION
Need for Creative and innovative thinking for quality – Essential theory about directed creativity, components of Creativity, Methodologies and approaches, individual and group creativity, organizational role in creativity, types of innovation, barriers to innovation, innovation process, establishing criterion for assessment of creativity & innovation.

UNIT II MECHANISM OF THINKING AND VISUALIZATION
Definitions and theory of mechanisms of mind heuristics and models: attitudes, Approaches and Actions that support creative thinking - Advanced study of visual elements and principles: line, plane, shape, form, pattern, texture gradation, color symmetry. Spatial relationships and compositions in 2 and 3 dimensional space - procedure for genuine graphical computer animation – Animation aerodynamics – virtual environments in scientific Visualization – Unifying principle of data management for scientific visualization – Visualization benchmarking.

UNIT III CREATIVITY
Methods and tools for Directed Creativity – Basic Principles – Tools that prepare the mind for creative thought – stimulation – Development and Actions: - Processes in creativity ICEDIP – Inspiration, Clarification, Distillation, Perspiration, Evaluation and Incubation – Creativity and Motivation The Bridge between man creativity and the rewards of innovativeness – Applying Directed Creativity.

UNIT IV CREATIVITY IN PROBLEM SOLVING
Generating and acquiring new ideas, product design, service design – case studies and hands-on exercises, stimulation tools and approaches, six thinking hats, lateral thinking – Individual activity, group activity, contextual influences.

UNIT V INNOVATION

TOTAL: 60 PERIODS

Note: Students will undergo the entire programme similar to a Seminar. It is activity based course. Students will undergo the programme with both theoretical and practical content. Each student will be required to come out with innovative products or services. This will be evaluated by the faculty member(s) handling the course and the consolidated marks can be taken as the final mark. No end semester examination is required for this course.
REFERENCES

2. Geoffrey Petty,” how to be better at Creativity”, The Industrial Society 1999
COURSE OBJECTIVE:
To understand the methods of managing brands and strategies for brand management.

COURSE OUTCOME:
To successfully establish and sustain brands and lead to extensions

UNIT I INTRODUCTION 8

UNIT II BRAND STRATEGIES 10

UNIT III BRAND COMMUNICATIONS 8
Brand image Building – Brand Loyalty programmes – Brand Promotion Methods – Role of Brand ambassadors, celebrities – On line Brand Promotions.

UNIT IV BRAND EXTENSION 9
Brand Adoption Practices – Different type of brand extension – Factors influencing Decision for extension – Re-branding and re-launching.

UNIT V BRAND PERFORMANCE 10

TOTAL: 45 PERIODS

TEXTBOOKS

REFERENCES
4. Jagdeep Kapoor, Brandex, Biztranza, India, 2005
COURSE OBJECTIVE:
To understand the concepts of effective retailing

COURSE OUTCOME:
To manage the retail chains and understand the retail customer’s behavior

UNIT I  INTRODUCTION  9
An overview of Global Retailing – Challenges and opportunities – Retail trends in India – Socio economic and technological Influences on retail management – Government of India policy implications on retails.

UNIT II  RETAIL FORMATS  9
Organized and unorganized formats – Different organized retail formats – Characteristics of each format – Emerging trends in retail formats – MNC’s role in organized retail formats.

UNIT III  RETAILING DECISIONS  9

UNIT IV  RETAIL SHOP MANAGEMENT  9

UNIT V  RETAIL SHOPPER BEHAVIOUR  9
Understanding of Retail shopper behavior – Shopper Profile Analysis – Shopping Decision Process - Factors influencing retail shopper behavior – Complaints Management - Retail sales force Management – Challenges in Retailing in India.

TOTAL: 45 PERIODS

TEXTBOOKS

REFERENCES
6. Dr.Jaspreet Kaur , Customer Relationship Management, Kogent solution.
COURSE OBJECTIVE:
To understand the meaning of services and the significance of marketing the services.

COURSE OUTCOME:
Will be able to apply the concepts of services marketing in promoting services.

UNIT I  INTRODUCTION  9

UNIT II  SERVICE MARKETING OPPORTUNITIES  9
Assessing service market potential - Classification of services – Expanded marketing mix – Service marketing – Environment and trends – Service market segmentation, targeting and positioning.

UNIT III  SERVICE DESIGN AND DEVELOPMENT  9

UNIT IV  SERVICE DELIVERY AND PROMOTION  9
Positioning of services – Designing service delivery System, Service Channel – Pricing of services, methods – Service marketing triangle - Integrated Service marketing communication.

UNIT V  SERVICE STRATEGIES  9

TOTAL: 45 PERIODS

TEXTBOOKS

REFERENCES
5. Gronroos, Service Management and Marketing –Wiley India.
COURSE OBJECTIVE:
This course introduces students to the basic concepts of advertising and sales promotion and how business organisations and other institutions carry out such activities.

COURSE OUTCOME:
Insight into the importance of advertising and sales promotion campaigns planning and objective setting in relation to consumer decision making processes.

UNIT I INTRODUCTION TO ADVERTISEMENT
9

UNIT II ADVERTISEMNT MEDIA
9

UNIT III SALES PROMOTION
9
Scope and role of sale promotion – Definition – Objectives of sales promotion - sales promotion techniques – Trade oriented and consumer oriented. Sales promotion – Requirement identification – Designing of sales promotion campaign – Involvement of salesmen and dealers – Out sourcing sales promotion national and international promotion strategies – Integrated promotion – Coordination within the various promotion techniques – Online sales promotions- case studies.

UNIT IV PUBLIC RELATIONS
9

UNIT V PUBLICITY
9

TEXT BOOKS
REFERENCES

COURSE OBJECTIVE:
To understand the need and importance of maintaining a good customer relationship.

COURSE OUTCOME:
To use strategic customer acquisition and retention techniques in CRM.

UNIT I INTRODUCTION

UNIT II UNDERSTANDING CUSTOMERS
Customer information Database – Customer Profile Analysis - Customer perception, Expectations analysis – Customer behavior in relationship perspectives; individual and group customer’s - Customer life time value – Selection of Profitable customer segments.

UNIT III CRM STRUCTURES

UNIT IV CRM PLANNING AND IMPLEMENTATION

UNIT V TRENDS IN CRM
e- CRM Solutions – Data Warehousing – Data mining for CRM – an introduction to CRM software packages.

TOTAL:45 PERIODS

TEXTBOOKS

REFERENCES
COURSE OBJECTIVES:

- The objective of the course is to provide conceptual understanding on the Rural Marketing with special reference to Indian context and develop skills required for planning of Rural Products.
- To create awareness about the applicability of the concepts, techniques and processes of marketing in rural context.
- To familiarize with the special problems related to sales in rural markets.

COURSE OUTCOMES:

Perspectives of rural marketing and the knowledge of the emerging managerial initiatives and relevant frameworks in rural marketing, institutions engaged in rural marketing.

UNIT I  OVERVIEW OF RURAL MARKETING  9


UNIT II  RURAL MARKETS & DECISION  9


UNIT III  PRODUCT & DISTRIBUTION  9

Product / Service Classification in Rural Marketing - New Product Development in Rural Marketing - Brand Management in Rural Marketing - Rural Distribution in channel management - Managing Physical distribution in Rural Marketing - Fostering Creativity & Innovation in Rural Marketing - Sales force Management in Rural Marketing.

UNIT IV  RURAL CONSUMER BEHAVIOUR IN MARKETING RESEARCH  9

Consumer Buyer Behaviour Model in Rural Marketing - Rural Marketing Research - Retail & IT models in Rural Marketing - CSR and Marketing Ethics in Rural Marketing - Source of Financing and credit agencies - Consumer Education & Consumer Methods in Promotion of Rural Marketing - Advertisement & Media Role in Rural Marketing Promotion Methods.

UNIT V  TRENDS IN RURAL MARKETING  9


TOTAL: 45 PERIODS

TEXTBOOKS

1. Rural Marketing – C G Krishnamacharyulu, Lalitha Ramakrishnan – Pearson Education
2. Rural Marketing: Indian Perspective By Awadhesh Kumar Singh Satyaprakash pandey New age publishers
3. A Textbook on Rural Consumer Behaviour in India: A Study of FMCGs By Dr. A Sarangapani

REFERENCE BOOKS

1. New Perspectives on Rural Marketing: Includes Agricultural Marketing By Ramkishen Y.
2. Rural Marketing, Pradeep Kashyap & Siddhartha Raut, Biztantra
3. Rural Marketing – U.C.Mathur, excel books, 1/e
4. Indian Rural Marketing Rajagopal Rawat Publishers
5. Integrated Rural Development – R. C. Arora (S. Chand & Co.)
OBJECTIVES:
Enables student to
- Understand the nuances of stock market operations
- Understand the techniques involved in deciding upon purchase or sale of securities

OUTCOME
- Become a good investment analyst

UNIT I INVESTMENT SETTING 8

UNIT II SECURITIES MARKETS 10

UNIT III FUNDAMENTAL ANALYSIS 9

UNIT IV TECHNICAL ANALYSIS 9

UNIT V PORTFOLIO MANAGEMENT 9
Portfolio analysis –Portfolio Selection –Capital Asset Pricing model – Portfolio Revision – Portfolio Evaluation – Mutual Funds.

TOTAL: 45 PERIODS

TEXTBOOKS

REFERENCES
OBJECTIVES:
To enable student
- Understand the modes of issuing securities
- Acquire financial evaluation technique of leasing and hire purchase

OUTCOME
- Good knowledge on merchant banking activities

UNIT I MERCHANT BANKING 5

UNIT II ISSUE MANAGEMENT 12

UNIT III OTHER FEE BASED SERVICES 10
Mergers and Acquisitions – Portfolio Management Services – Credit Syndication – Credit Rating – Mutual Funds - Business Valuation.

UNIT IV FUND BASED FINANCIAL SERVICES 10

UNIT V OTHER FUND BASED FINANCIAL SERVICES 8

TOTAL: 45 PERIODS

TEXTBOOKS

REFERENCES:
5. Website of SEBI
OBJECTIVES:
To enable student
• Understand export import finance and forex management
• Understand the documentation involved in international trade

OUTCOME
• Possess good knowledge on international trade and the documentation involved in it.

UNIT I INTERNATIONAL TRADE

UNIT II EXPORT AND IMPORT FINANCE

UNIT III FOREX MANAGEMENT

UNIT IV DOCUMENTATION IN INTERNATIONAL TRADE

UNIT V EXPORT PROMOTION SCHEMES

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
3. Website of Indian Government on EXIM policy
OBJECTIVES:
Student will acquire
• Nuances involved in short term corporate financing
• Good ethical practices

OUTCOME
• Good ethical corporate manager

UNIT I  INDUSTRIAL FINANCE  9
Indian Capital Market – Basic problem of Industrial Finance in India. Equity – Debenture financing – Guidelines from SEBI, advantages and disadvantages and cost of various sources of Finance – Finance from international sources, financing of exports – role of EXIM bank and commercial banks.– Finance for rehabilitation of sick units.

UNIT II  SHORT TERM-WORKING CAPITAL FINANCE  6

UNIT III  ADVANCED FINANCIAL MANAGEMENT  12
Appraisal of Risky Investments, certainty equivalent of cash flows and risk adjusted discount rate, risk analysis in the context of DCF methods using Probability information, nature of cash flows, Sensitivity analysis; Simulation and investment decision, Decision tree approach in investment decisions.

UNIT IV  FINANCING DECISION  10
Simulation and financing decision - cash inadequacy and cash insolvency- determining the probability of cash insolvency- Financing decision in the Context of option pricing model and agency costs- Inter-dependence of investment- financing and Dividend decisions.

UNIT V  CORPORATE GOVERNANCE  8
Corporate Governance - SEBI Guidelines- Corporate Disasters and Ethics- Corporate Social Responsibility- Stakeholders and Ethics- Ethics, Managers and Professionalism.

TOTAL: 45 PERIODS

TEXTBOOKS

REFERENCES
5. Website of SEBI
OBJECTIVES:
Enable students to
- Comprehend the importance of Micro finance
- Understand the techniques involved in their evaluation

OUTCOME
- Possess good knowledge in micro finance management

UNIT I  INTRODUCTION TO MICROFINANCE

UNIT II  FINANCIAL AND OPERATIONAL EVALUATION

UNIT III  OTHER EVALUATIONS OF MICROFINANCE

UNIT IV  MICROFINANCE IN INDIA
Challenges to Microfinance movement – Demand and Supply of Micro financial services – State Intervention in rural credit – RBI Initiatives - NABARD & SHG – Bank Linkup & Programs- – Governance and the constitution of the Board of various forms of MFIs – Intermediaries for Microfinance – State sponsored Organizations.

UNIT V  ISSUES, TRENDS AND FRONTIERS OF MICROFINANCE
Issue – Role of Technology-Strategic issues in Microfinance: Sustainability - opening new markets – Gender issues

TOTAL: 45 PERIODS

TEXTBOOKS

REFERENCES
www. microfinancesummit.org.
COURSE OBJECTIVES:
- Grasp how banks raise their sources and how they deploy it and manage the associated risks
- Understand e-banking and the threats that go with it.

COURSE OUTCOME:
- Price various types of loans proposed by banks to various prospective borrowers with different risk profiles and evaluate the performance of banks

UNIT I  OVERVIEW OF INDIAN BANKING SYSTEM  9

UNIT II  SOURCES AND APPLICATION OF BANK FUNDS  9
Capital adequacy, Deposits and non-deposit sources, Designing of deposit schemes and pricing of deposit services, application of bank funds – Investments and Lending functions, Types of lending – Fund based, non-fund based, asset based – Different types of loans and their features, Major components of a typical loan policy document, Steps involved in Credit analysis, Credit delivery and administration, Pricing of loans, Customer profitability analysis.

UNIT II  CREDIT MONITORING AND RISK MANAGEMENT  9
Need for credit monitoring, Signals of borrowers’ financial sickness, Financial distress prediction models – Rehabilitation process, Risk management – Interest rate, liquidity, forex, credit, market, operational and solvency risks – risk measurement process and mitigation, Basic understanding of NPAs and ALM.

UNIT IV  MERGERS, DIVERSIFICATION AND PERFORMANCE EVALUATION  9
Mergers and Diversification of banks into securities market, underwriting, Mutual funds and Insurance business, Risks associated therewith. Performance analysis of banks – background factors, ratio analysis and CAMELS.

UNIT V  HIGH TECH E-BANKING  9

TOTAL: 45 PERIODS

TEXTBOOKS

REFERENCES:
COURSE OBJECTIVE:
To examine managerial styles in terms of concern for production and concern for people. To assess different systems of management and relate these systems to organisational characteristics.

COURSE OUTCOME:
Students will gain knowledge about appropriate style of managerial behaviour.

UNIT I DEFINING THE MANAGERIAL JOB 8

UNIT II DESIGNING THE MANAGERIAL JOB 12

UNIT III THE CONCEPT OF MANAGERIAL EFFECTIVENESS 7
Definition – The person, process, product approaches – Bridging the Gap – Measuring Managerial Effectiveness – Current Industrial and Government practices in the Management of Managerial Effectiveness- the Effective Manager as an Optimizer.

UNIT IV ENVIRONMENTAL ISSUES IN MANAGERIAL EFFECTIVENESS 8

UNIT V DEVELOPING THE WINNING EDGE 10
Organisational and Managerial Efforts – Self Development – Negotiation Skills – Development of the Competitive Spirit – Knowledge Management – Fostering Creativity and innovation.

TOTAL: 45 PERIODS

REFERENCES
COURSE OBJECTIVE:
To develop and strengthen entrepreneurial quality and motivation in students. To impart basic entrepreneurial skills and understandings to run a business efficiently and effectively.

COURSE OUTCOME:
Students will gain knowledge and skills needed to run a business.

UNIT I ENTREPRENEURIAL COMPETENCE 6

UNIT II ENTREPRENEURIAL ENVIRONMENT 12

UNIT III BUSINESS PLAN PREPARATION 12

UNIT IV LAUNCHING OF SMALL BUSINESS 10

UNIT V MANAGEMENT OF SMALL BUSINESS 5
Monitoring and Evaluation of Business - Preventing Sickness and Rehabilitation of Business Units- Effective Management of small Business.

TOTAL: 45 PERIODS

TEXTBOOKS

REFERENCES
COURSE OBJECTIVE:
To learn how an organization can be designed and developed to deal with the challenges from environment, technology, and its own processes.

COURSE OUTCOME:
Students will be able to analyze organizations more accurately and deeply by applying organization theory.

UNIT I ORGANISATION & ITS ENVIRONMENT

UNIT II ORGANIZATIONAL DESIGN
Organizational Design – Determinants – Components – Types - Basic Challenges of design – Differentiation, Integration, Centralization, Decentralization, Standardization, Mutual adjustment-Mechanistic and Organic Structures- Technological and Environmental Impacts on Design-Importance of Design – Success and Failures in design - Implications for Managers.

UNIT III ORGANISATIONAL CULTURE
Understanding Culture – Strong and Weak Cultures – Types of Cultures – Importance of Culture - Creating and Sustaining Culture - Culture and Strategy - Implications for practicing Managers.

UNIT IV ORGANISATIONAL CHANGE

UNIT V ORGANISATION EVOLUTION AND SUSTENANCE
Organizational life cycle – Models of transformation – Models of Organizational Decision making – Organizational Learning – Innovation, Intrapreneurship and Creativity-HR implications.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
COURSE OBJECTIVE:
To explore contemporary knowledge and gain a conceptual understanding of industrial relations.

COURSE OUTCOME:
Students will know how to resolve industrial relations and human relations problems and promote welfare of industrial labour.

UNIT I  INDUSTRIAL RELATIONS  7
Concepts – Importance – Industrial Relations problems in the Public Sector – Growth of Trade Unions – Codes of conduct.

UNIT II  INDUSTRIAL CONFLICTS  12

UNIT III  LABOUR WELFARE  8

UNIT IV  INDUSTRIAL SAFETY  9

UNIT V  WELFARE OF SPECIAL CATEGORIES OF LABOUR  9

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
COURSE OBJECTIVE:
To have a broad understanding of the legal principles governing the employment relationship at individual and collective level. To familiarise the students to the practical problems inherent in the implementation of labour statutes.

COURSE OUTCOME:
To appreciate the application of labour laws.

Legal Provision relating to
a) Wages
b) Working Conditions and Labour Welfare
c) Industrial Relations
d) Social Security

Contained in the following acts are to be studied.

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<td>The Employee’s Provident Fund &amp; Misc. Act, 1952</td>
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<td>The Employees State Insurance Act, 1948</td>
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<td>Contract Labour Regulations and Abolition Act, 1970</td>
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<td>The Child Labour Prevention and Regulation Act, 1986</td>
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</table>

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES
5. Respective Bare Acts.
COURSE OBJECTIVE:
To help students understand the transformation in the role of HR functions from being a support function to strategic function.

COURSE OUTCOME:
Students will have a better understanding of the tools and techniques used by organizations to meet current challenges.

UNIT I  HUMAN RESOURCE DEVELOPMENT  10

UNIT II  E-HRM  6

UNIT III  CROSS CULTURAL HRM  7

UNIT IV  CAREER & COMPETENCY DEVELOPMENT  10

UNIT V  EMPLOYEE COACHING & COUNSELING  12

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
COURSE OBJECTIVES

- To understand the various advanced databases used in the organization
- To be aware of recent trends in database management

COURSE OUTCOMES

- Awareness of database models
- Knowledge of database technologies

UNIT I INTRODUCTION 9
DBMS Models - Multimedia Databases, Parallel Databases, embedded, web, spatial, temporal databases, Virtualization, Active Databases - Embedded databases - Web databases.

UNIT II DATABASE IMPLEMENTATION 9

UNIT III DISTRIBUTED DATABASES 9

UNIT IV OBJECT ORIENTED DATABASES 9
Object Oriented Concepts – Data Object Models –Object Oriented Databases – Issues in OODBMS - Object Oriented Relational Databases – Object Definition Languages – Object Query Languages

UNIT V EMERGING TRENDS 9
Data Mining – Data warehousing – Star, Snowflake, Fact Constellation; open source database systems, Scripting Language, JDBC, ODBC

TOTAL: 45 PERIODS

TEXTBOOKS
1. Peter Rob, Carlos Coronel, Database System and Design, Implementation and Management, 7 th edition, Cengage Learning,

REFERENCES
COURSE OBJECTIVE
• To understand the practices and technology to start an online business

COURSE OUTCOME
• To know how to build and manage an e-business

UNIT I  INTRODUCTION TO e-BUSINESS  8
e-business, e-business vs e-commerce, Economic forces – advantages – myths – e-business
models, design, develop and manage e-business, Web 2.0 and Social Networking, Mobile
Commerce, S-commerce

UNIT II  TECHNOLOGY INFRASTRUCTURE  10
Internet and World Wide Web, internet protocols - FTP, intranet and extranet, information
publishing technology- basics of web server hardware and software.

UNIT III  BUSINESS APPLICATIONS  10
Consumer oriented e-business – e-tailing and models - Marketing on web – advertising, e-mail
marketing, affiliated programs - e-CRM; online services, Business oriented e-business, e-
governance, EDI on the internet, Delivery management system, Web Auctions, Virtual communities
and Web portals – social media marketing

UNIT IV  e-BUSINESS PAYMENTS AND SECURITY  9
E-payments - Characteristics of payment of systems, protocols, e-cash, e-cheque and Micro

UNIT V  LEGAL AND PRIVACY ISSUES  8
Legal, Ethics and privacy issues – Protection needs and methodology – consumer protection,
cyber laws, contracts and warranties, Taxation and encryption policies.

TOTAL: 45 PERIODS

TEXTBOOKS
1. Harvey M.Deitel, Paul J.Deitel, Kate Steinbuhler, e-business and e-commerce for
managers, Pearson, 2011.
2. Efraim Turban, Jae K. Lee, David King, Ting Peng Liang, Deborrah Turban, Electronic

REFERENCES
1. Parag Kulkarni, Sunita Jahirabadkao, Pradeep Chande, e business, Oxford University
2. Hentry Chan & el , E-Commerce – fundamentals and Applications, Wiley India Pvt Ltd,
2007.
3. Gary P. Schneider, Electronic commerce, Thomson course technology, Fourth annual
edition, 2007
4. Bharat Bhasker, Electronic Commerce – Frame work technologies and Applications, 3rd
5. Kamlesh K.Bajaj and Debjani Nag, Ecommerce- the cutting edge of Business, Tata
COURSE OBJECTIVES
- To understand project management cycle in software development
- To study various project estimation and quality models in software development

COURSE OUTCOMES
- Knowledge of software development process and quality models
- Knowledge of software project estimation and quality assurance

UNIT I   INTRODUCTION

UNIT II   SOFTWARE METRICS
Goal, Question, Metric (GQM) model, Product Quality metrics, In process Quality metrics, Metrics for software maintenance and testing, Complexity Metrics.

UNIT III  SOFTWARE PROJECT ESTIMATION

UNIT IV   SOFTWARE QUALITY

UNIT V   SOFTWARE QUALITY ASSURANCE

TOTAL: 45 PERIODS

TEXTBOOKS

REFERENCES
COURSE OBJECTIVES
- To know how to derive meaning from huge volume of data and information
- To understand how knowledge discovering process is used in business decision making

COURSE OUTCOMES
- Big Data Management
- Appreciate the techniques of knowledge discovery for business applications

UNIT I INTRODUCTION
Data mining, Text mining, Web mining, Spatial mining, Process mining, BI process- Private and Public intelligence, Strategic assessment of implementing BI

UNIT II DATA WAREHOUSING
Data warehouse – characteristics and view - OLTP and OLAP - Design and development of data warehouse, Meta data models, Extract/ Transform / Load (ETL) design

UNIT III DATA MINING TOOLS, METHODS AND TECHNIQUES
Regression and correlation; Classification- Decision trees; clustering –Neural networks; Market basket analysis- Association rules- Genetic algorithms and link analysis, Support Vector Machine, Ant Colony Optimization

UNIT IV MODERN INFORMATION TECHNOLOGY AND ITS BUSINESS OPPORTUNITIES
Business intelligence software, BI on web, Ethical and legal limits, Industrial espionage, modern techniques of crypto analysis, managing and organizing for an effective BI Team.

UNIT V BI AND DATA MINING APPLICATIONS
Applications in various sectors – Retailing, CRM, Banking, Stock Pricing, Production, Crime, Genetics, Medical, Pharmaceutical.

TOTAL: 45 PERIODS

TEXTBOOKS
1. Jaiwei Ham and Micheline Kamber, Data Mining concepts and techniques, Kauffmann Publishers 2006
2. Efraim Turban, Ramesh Sharda, Jay E. Aronson and David King, Business Intelligence, Prentice Hall, 2008.

REFERENCES
5. G. K. Gupta, Introduction to Data mining with Case Studies, Prentice hall of India, 2011
7. Elizabeth Vitt, Michael Luckevich Stacia Misner, Business Intelligence, Microsoft, 2011
9. Galit Shmueli, Nitin R. Patel and Peter C. Bruce, Data Mining for Business Intelligence – Concepts, Techniques and Applications Wiley, India, 2010
COURSE OBJECTIVE:
- Understand the scope and practice of business logistics and supply chain management

COURSE OUTCOME:
- Student gains knowledge on effective management of the logistics and supply chain

UNIT I INTRODUCTION

UNIT II MANAGING FLOWS

UNIT III INVENTORY AND WAREHOUSING
Inventory–objectives, bullwhip effect, control - Probabilistic inventory models, Risk pooling, Vendor managed inventory, Multi-echelon inventory.

UNIT IV TRANSPORTATION AND PACKAGING
Transportation – Drivers, Modes, Measures - Strategies for Transportation, 3PL and 4PL, Vehicle Routing and Scheduling.

UNIT V ORGANISATION AND CONTROL

TOTAL: 45 PERIODS

TEXTBOOKS:

REFERENCES:
COURSE OBJECTIVE:
To help understand how service performance can be improved by studying services operations management.

COURSE OUTCOME:
To design and operate a service business using the concepts, tools and techniques of service operations management.

UNIT I  INTRODUCTION
Services – Importance, role in economy, service sector – growth; Nature of services -Service classification , Service Package, distinctive characteristics , open-systems view; Service Strategy – Strategic service vision, competitive environment, generic strategies, winning customers; Role of information technology; stages in service firm competitiveness; Internet strategies - Environmental strategies.

UNIT II  SERVICE DESIGN
New Service Development – Design elements – Service Blue-printing - process structure – generic approaches –Value to customer; Retail design strategies – store size – Network configuration ; Managing Service Experience –experience economy, key dimensions ; Vehicle Routing and Scheduling

UNIT III  SERVICE QUALITY

UNIT IV  SERVICE FACILITY
Servicescapes – behaviour - environmental dimensions – framework; Facility design – nature, objectives, process analysis – process flow diagram, process steps, simulation; Service facility layout; Service Facility Location – considerations, facility location techniques – metropolitan metric, Euclidean, centre of gravity, retail outlet location , location set covering problem

UNIT V  MANAGING CAPACITY AND DEMAND
Managing Demand – strategies; Managing capacity – basic strategies, supply management tactics, operations planning and control; Yield management; Inventory Management in Services– Retail Discounting Model, Newsvendor Model; Managing Waiting Lines –Queueing systems, psychology of waiting; Managing for growth- expansion strategies, franchising , globalization.

TOTAL: 45 PERIODS

TEXTBOOKS

REFERENCES
COURSE OBJECTIVE:
To learn the concepts of managing projects.

COURSE OUTCOME:
To apply project management principles in business situations to optimize resource utilization and time optimisation.

UNIT I     INTRODUCTION TO PROJECT MANAGEMENT

UNIT II    PLANNING AND BUDGETING

UNIT III   SCHEDULING & RESOURCE ALLOCATION

UNIT IV   CONTROL AND COMPLETION

UNIT V    PROJECT ORGANISATION & CONFLICT MANAGEMENT

TOTAL: 45 PERIODS

TEXTBOOKS

REFERENCES
COURSE OBJECTIVE:
To gain insights about the importance of lean manufacturing and six sigma practices.

COURSE OUTCOME:
The student would be able to relate the tools and techniques of lean sigma to increase productivity.

UNIT I LEAN & SIX SIGMA BACKGROUND AND FUNDAMENTALS 9
Historical Overview – Definition of quality – What is six sigma - TQM and Six sigma - lean manufacturing and six sigma - six sigma and process tolerance – Six sigma and cultural changes – six sigma capability – six sigma need assessments - implications of quality levels, Cost of Poor Quality (COPQ), Cost of Doing Nothing – assessment questions

UNIT II THE SCOPE OF TOOLS AND TECHNIQUES 9

UNIT III SIX SIGMA METHODOLOGIES 9
Design For Six Sigma (DFSS), Design For Six Sigma Method - Failure Mode Effect Analysis (FMEA), FMEA process - Risk Priority Number (RPN)- Six Sigma and Leadership, committed leadership – Change Acceleration Process (CAP)- Developing communication plan – Stakeholder

UNIT IV SIX SIGMA IMPLEMENTATION AND CHALLENGES 9
Tools for implementation – Supplier Input Process Output Customer (SIPOC) – Quality Function Deployment or House of Quality (QFD) – alternative approach –implementation – leadership training, close communication system, project selection – project management and team – champion training – customer quality index – challenges – program failure, CPQ vs six sigma, structure the deployment of six sigma – cultural challenge – customer/internal metrics

UNIT V EVALUATION AND CONTINUOUS IMPROVEMENT METHODS 9
Evaluation strategy – the economics of six sigma quality, Return on six Sigma (ROSS), ROI, poor project estimates – continuous improvement – lean manufacturing – value, customer focus, Perfection, focus on waste, overproduction – waiting, inventory in process (IIP), processing waste, transportation, motion, making defective products, underutilizing people – Kaizen – 5S

TOTAL: 45 PERIODS

REFERENCES:
3. Fred Soleimannejed , Six Sigma, Basic Steps and Implementation, AuthorHouse, 2004
# B.E. MECHANICAL ENGINEERING
## I – VIII SEMESTERS CURRICULUM AND SYLLABUS

### SEMESTER I

<table>
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<th>SL. No.</th>
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ELECTIVES FOR B.E. MECHANICAL ENGINEERING

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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
- Project
- Assignment
- Reviews
- Creative writing
- Poster making, etc.

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 L T P C 3 1 0 4

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

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.

TEXT BOOKS:

REFERENCES:

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

10
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

UNIT III
QUANTUM PHYSICS


UNIT IV
ACOUSTICS AND ULTRASONICS

Production of ultrasonics 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.

TOTAL: 45 PERIODS

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.

TEXT BOOKS:
1. Arumugam M. Engineering Physics. Anuradha publishers, 2010

REFERENCES:
1. Searls and Zemansky. University Physics, 2009
5. Rajagopal K. Engineering Physics. PHI, New Delhi, 2011
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 polydispersity 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 isochore(problems).

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY

UNIT IV PHASE RULE AND ALLOYS

UNIT V NANOCHEMISTRY
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

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.
TEXT BOOKS:

REFERENCES:

GE6151 COMPUTER PROGRAMMING

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:

GE6152       ENGINEERING GRAPHICS
L T P C
2 0 3 4

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 5+9
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 5+9
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 6+9
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) 3
Introduction to drafting packages and demonstration of their use.

TOTAL: 75 PERIODS

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.

TEXT BOOK:

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

L T P C
0 0 3 2

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:
1. Search, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions – Includes Parameter Passing
9. Program using Recursive Function and conversion from given program to flow chart.
10. 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.
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

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.

TOTAL: 30 PERIODS

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
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
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
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 - 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
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.

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

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%

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 9+3
Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green’s theorem in a plane, Gauss divergence theorem and Stokes’ theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.

UNIT II ORDINARY DIFFERENTIAL EQUATIONS 9+3
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 9+3

UNIT IV ANALYTIC FUNCTIONS 9+3
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 9+3
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.

TEXT BOOKS:

REFERENCES:
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
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

UNIT V  ADVANCED ENGINEERING MATERIALS

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.

TEXT BOOKS:

REFERENCES:
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
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.

TEXT BOOKS:

REFERENCES:

GE6252 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING L T P C 4 0 0 4

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

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:

GE6253  ENGINEERING MECHANICS  L T P C
3 1 0 4

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
Introduction – Units and Dimensions – Laws of Mechanics – Lami’s theorem, Parallelogram and
triangular Law of forces — Vectorial representation of forces – Vector operations of forces -additions,
subtraction, dot product, cross product – Coplanar Forces – rectangular components – Equilibrium of
a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces –
Principle of transmissibility .

UNIT II  EQUILIBRIUM OF RIGID BODIES  12
Free body diagram – Types of supports –Action and reaction forces –stable equilibrium – Moments
and Couples – Moment of a force about a point and about an axis – Vectorial representation of
moments and couples – Scalar components of a moment – Varignon’s theorem – Single equivalent
force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

UNIT III  PROPERTIES OF SURFACES AND SOLIDS  12
Centroids and centre of mass– Centroids of lines and areas - Rectangular, circular, triangular areas
by integration – T section, I section, - Angle section, Hollow section by using standard formula –

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.

TEXT BOOKS:

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>

GE6262   PHYSICS AND CHEMISTRY LABORATORY – II

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:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potentiometer</td>
<td>5 Nos</td>
</tr>
<tr>
<td>Flame photo meter</td>
<td>5 Nos</td>
</tr>
<tr>
<td>Weighing Balance</td>
<td>5 Nos</td>
</tr>
<tr>
<td>Conductivity meter</td>
<td>5 Nos</td>
</tr>
</tbody>
</table>

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  
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  

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS  
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  

UNIT V Z-TRANSFORMS AND DIFFERENCE EQUATIONS  

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

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  
CE6306 STRENGTH OF MATERIALS

OBJECTIVES:
To understand the stresses developed in bars, compounds bars, beams, shafts, cylinders and spheres.

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS

UNIT II TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM

UNIT III TORSION
Torsion formulation stresses and deformation in circular and hollows shafts – Stepped shafts – Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs.

UNIT IV DEFLECTION OF BEAMS
Double Integration method – Macaulay’s method – Area moment method for computation of slopes and deflections in beams - Conjugate beam and strain energy – Maxwell’s reciprocal theorems.

UNIT V THIN CYLINDERS, SPHERES AND THICK CYLINDERS
Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin and thick cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lame’s theorem.

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

OUTCOMES:
• Upon completion of this course, the students can able to apply mathematical knowledge to calculate the deformation behavior of simple structures.
• Critically analyse problem and solve the problems related to mechanical elements and analyse the deformation behavior for different types of loads.
TEXT BOOKS:

REFERENCES:

ME6301 ENGINEERING THERMODYNAMICS

OBJECTIVES:
- To familiarize the students to understand the fundamentals of thermodynamics and to perform thermal analysis on their behavior and performance.

(Use of Standard and approved Steam Table, Mollier Chart, Compressibility Chart and Psychrometric Chart permitted)

UNIT I BASIC CONCEPTS AND FIRST LAW

UNIT II SECOND LAW AND AVAILABILITY ANALYSIS

UNIT III PROPERTIES OF PURE SUBSTANCE AND STEAM POWER CYCLE
UNIT IV  IDEAL AND REAL GASES, THERMODYNAMIC RELATIONS  
Properties of ideal gas- Ideal and real gas comparison- Equations of state for ideal and real gases- 
Reduced properties- Compressibility factor- Principle of Corresponding states. -Generalised 
Compressibility Chart and its use- Maxwell relations, Tds Equations, Difference and ratio of heat 
capacities, Energy equation, Joule-Thomson Coefficient, Clausius Clapeyron equation, Phase 
Change Processes. Simple Calculations.

UNIT V  GAS MIXTURES AND PSYCHROMETRY  
Mole and Mass fraction, Dalton’s and Amagat’s Law. Properties of gas mixture – Molar mass, gas 
constant, density, change in internal energy, enthalpy, entropy and Gibbs function. Psychrometric 
properties, Psychrometric charts. Property calculations of air vapour mixtures by using chart and 
expressions. Psychrometric process – adiabatic saturation, sensible heating and cooling, 
humidification, dehumidification, evaporative cooling and adiabatic mixing. Simple Applications

OUTCOMES:
• Upon completion of this course, the students can able to apply the Thermodynamic Principles 
to Mechanical Engineering Application.
• Apply mathematical fundamentals to study the properties of steam, gas and gas mixtures.

TEXT BOOKS :

REFERENCES :
Hall of India Pvt. Ltd, 2006

CE6451  FLUID MECHANICS AND MACHINERY  
OBJECTIVES:
• The applications of the conservation laws to flow through pipes and hydraulic machines are 
   studied
• To understand the importance of dimensional analysis.
• To understand the importance of various types of flow in pumps and turbines.

UNIT I  FLUID PROPERTIES AND FLOW CHARACTERISTICS  
Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific 
gravity, viscosity, compressibility, vapor pressure, surface tension and capillarity. Flow characteristics 
– concept of control volume - application of continuity equation, energy equation and momentum 
equation.
UNIT II  FLOW THROUGH CIRCULAR CONDUITS 8

UNIT III  DIMENSIONAL ANALYSIS 9
Need for dimensional analysis – methods of dimensional analysis – Similitude – types of similitude - Dimensionless parameters - application of dimensionless parameters – Model analysis.

UNIT IV  PUMPS 10

UNIT V  TURBINES 10

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to apply mathematical knowledge to predict the properties and characteristics of a fluid.
- Can critically analyse the performance of pumps and turbines.

TEXT BOOK:

REFERENCES:

ME6302  MANUFACTURING TECHNOLOGY – I

OBJECTIVES:
- To introduce the concepts of basic manufacturing processes and fabrication techniques, such as metal casting, metal joining, metal forming and manufacture of plastic components.

UNIT I  METAL CASTING PROCESSES 9
Sand Casting : Sand Mould – Type of patterns - Pattern Materials – Pattern allowances – Moulding sand Properties and testing – Cores – Types and applications – Moulding machines – Types and applications; Melting furnaces : Blast and Cupola Furnaces; Principle of special casting processes : Shell - investment – Ceramic mould – Pressure die casting - Centrifugal Casting - CO₂ process – Stir casting; Defects in Sand casting
UNIT II JOINING PROCESSES

Operating principle, basic equipment, merits and applications of: Fusion welding processes: Gas welding - Types – Flame characteristics; Manual metal arc welding – Gas Tungsten arc welding - Gas metal arc welding – Submerged arc welding – Electro slag welding; Operating principle and applications of: Resistance welding - Plasma arc welding – Thermit welding – Electron beam welding – Friction welding and Friction Stir Welding; Brazing and soldering; Weld defects: types, causes and cure.

UNIT III METAL FORMING PROCESSES


UNIT IV SHEET METAL PROCESSES


UNIT V MANUFACTURE OF PLASTIC COMPONENTS


OUTCOMES:
• Upon completion of this course, the students can able to apply the different manufacturing process and use this in industry for component production

TEXT BOOKS:

REFERENCES:
OBJECTIVES

- To understand the basic concepts of different types of electrical machines and their performance.
- To study the different methods of starting D.C motors and induction motors.
- To study the conventional and solid-state drives

UNIT I  INTRODUCTION

Basic Elements – Types of Electric Drives – factors influencing the choice of electrical drives – heating and cooling curves – Loading conditions and classes of duty – Selection of power rating for drive motors with regard to thermal overloading and Load variation factors

UNIT II  DRIVE MOTOR CHARACTERISTICS

Mechanical characteristics – Speed-Torque characteristics of various types of load and drive motors – Braking of Electrical motors – DC motors: Shunt, series and compound - single phase and three phase induction motors.

UNIT III  STARTING METHODS

Types of D.C Motor starters – Typical control circuits for shunt and series motors – Three phase squirrel cage and slip ring induction motors.

UNIT IV  CONVENTIONAL AND SOLID STATE SPEED CONTROL OF D.C. DRIVES

Speed control of DC series and shunt motors – Armature and field control, Ward-Leonard control system - Using controlled rectifiers and DC choppers – applications.

UNIT V  CONVENTIONAL AND SOLID STATE SPEED CONTROL OF A.C. DRIVES

Speed control of three phase induction motor – Voltage control, voltage / frequency control, slip power recovery scheme – Using inverters and AC voltage regulators – applications.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon Completion of this subject, the students can able to explain different types of electrical machines and their performance.

TEXT BOOKS


REFERENCES

ME6311 MANUFACTURING TECHNOLOGY LABORATORY – I

OBJECTIVES:
- To Study and practice the various operations that can be performed in lathe, shaper, drilling, milling machines etc. and to equip with the practical knowledge required in the core industries.

LIST OF EXPERIMENTS
Machining and Machining time estimations for:
1. Taper Turning
2. External Thread cutting
3. Internal Thread Cutting
4. Eccentric Turning
5. Knurling
6. Square Head Shaping
7. Hexagonal Head Shaping

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to demonstrate and fabricate different types of components using the machine tools

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S. NO.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Centre Lathes</td>
<td>7 Nos.</td>
</tr>
<tr>
<td>2</td>
<td>Horizontal Milling Machine</td>
<td>1 No</td>
</tr>
<tr>
<td>3</td>
<td>Vertical Milling Machine</td>
<td>1 No</td>
</tr>
<tr>
<td>4</td>
<td>Shaper</td>
<td>1 Nos.</td>
</tr>
</tbody>
</table>

CE6461 FLUID MECHANICS AND MACHINERY LABORATORY

OBJECTIVES:
- Upon Completion of this subject, the students can able to have hands on experience in flow measurements using different devices and also perform calculation related to losses in pipes and also perform characteristic study of pumps, turbines etc.,

LIST OF EXPERIMENTS
1. Determination of the Coefficient of discharge of given Orifice meter.
2. Determination of the Coefficient of discharge of given Venturi meter.
3. Calculation of the rate of flow using Rota meter.
4. Determination of friction factor for a given set of pipes.
5. Conducting experiments and drawing the characteristic curves of centrifugal pump/submergible pump
6. Conducting experiments and drawing the characteristic curves of reciprocating pump.
7. Conducting experiments and drawing the characteristic curves of Gear pump.
8. Conducting experiments and drawing the characteristic curves of Pelton wheel.
9. Conducting experiments and drawing the characteristics curves of Francis turbine.
10. Conducting experiments and drawing the characteristic curves of Kaplan turbine.

TOTAL: 45 PERIODS
OUTCOMES:
- Ability to use the measurement equipments for flow measurement
- Ability to do performance trust on different fluid machinery

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S. NO.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Orifice meter setup</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Venturi meter setup</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Rotameter setup</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Pipe Flow analysis setup</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Centrifugal pump/submerged pump setup</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Reciprocating pump setup</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Gear pump setup</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Pelton wheel setup</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Francis turbine setup</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Kaplan turbine setup</td>
<td>1</td>
</tr>
</tbody>
</table>

EE6365    ELECTRICAL ENGINEERING LABORATORY    L T P C
0 0 3 2

OBJECTIVES:
- To validate the principles studied in theory by performing experiments in the laboratory

LIST OF EXPERIMENTS
1. Load test on DC Shunt & DC Series motor
2. O.C.C & Load characteristics of DC Shunt and DC Series generator
3. Speed control of DC shunt motor (Armature, Field control)
4. Load test on single phase transformer
5. O.C & S.C Test on a single phase transformer
6. Regulation of an alternator by EMF & MMF methods.
7. V curves and inverted V curves of synchronous Motor
8. Load test on three phase squirrel cage Induction motor
9. Speed control of three phase slip ring Induction Motor
10. Load test on single phase Induction Motor.
11. Study of DC & AC Starters

TOTAL: 45 PERIODS

OUTCOMES
- Ability to perform speed characteristic of different electrical machine

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DC Shunt motor</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>DC Series motor</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>DC shunt motor-DC Shunt Generator set</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>DC Shunt motor-DC Series Generator set</td>
<td>1</td>
</tr>
</tbody>
</table>
MA6452  
STATISTICS AND NUMERICAL METHODS  
L T P C  
3 1 0 4  

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

UNIT I  TESTING OF HYPOTHESIS  
Large sample test based on Normal distribution for single mean and difference of means - Tests based on t, \( \chi^2 \) and F distributions for testing means and variances – Contingency table (Test for Independency) – Goodness of fit.

UNIT II  DESIGN OF EXPERIMENTS  
One way and two way classifications - Completely randomized design – Randomized block design – Latin square design - \( 2^k \) factorial design.

UNIT III  SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS  

UNIT IV  INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION  
Lagrange’s and Newton’s divided difference interpolations – Newton’s forward and backward difference interpolation – Approximation of derivates using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson’s 1/3 rules.

UNIT V  NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS  

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

OUTCOMES  
• It helps the students to have a clear perception of the power of statistical and numerical techniques, ideas and would be able to demonstrate the applications of these techniques to problems drawn from industry, management and other engineering fields.

TEXT BOOKS  
REFERENCES

ME6401

KINEMATICS OF MACHINERY

L T P C
3 0 0 3

OBJECTIVES:
• To understand the basic components and layout of linkages in the assembly of a system / machine.
• To understand the principles in analyzing the assembly with respect to the displacement, velocity, and acceleration at any point in a link of a mechanism.
• To understand the motion resulting from a specified set of linkages, design few linkage mechanisms and cam mechanisms for specified output motions.
• To understand the basic concepts of toothed gearing and kinematics of gear trains and the effects of friction in motion transmission and in machine components.

UNIT I  BASICS OF MECHANISMS

UNIT II  KINEMATICS OF LINKAGE MECHANISMS

UNIT III  KINEMATICS OF CAM MECHANISMS

UNIT IV  GEARS AND GEAR TRAINS
UNIT V  FRICTION IN MACHINE ELEMENTS
Surface contacts – Sliding and Rolling friction – Friction drives – Friction in screw threads – Bearings and lubrication – Friction clutches – Belt and rope drives – Friction in brakes: Band and Block brakes.
TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can apply fundamentals of mechanism for the design of new mechanisms and analyse them for optimum design.

TEXT BOOKS:

REFERENCES:

ME6402  MANUFACTURING TECHNOLOGY – II

OBJECTIVES:
• To understand the concept and basic mechanics of metal cutting, working of standard machine tools such as lathe, shaping and allied machines, milling, drilling and allied machines, grinding and allied machines and broaching.
• To understand the basic concepts of Computer Numerical Control (CNC) of machine tools and CNC Programming

UNIT I  THEORY OF METAL CUTTING
Mechanics of chip formation, single point cutting tool, forces in machining, Types of chip, cutting tools – nomenclature, orthogonal metal cutting, thermal aspects, cutting tool materials, tool wear, tool life, surface finish, cutting fluids and Machinability.

UNIT II  TURNING MACHINES
Centre lathe, constructional features, specification, operations – taper turning methods, thread cutting methods, special attachments, machining time and power estimation. Capstan and turret lathes- tool layout – automatic lathes: semi automatic – single spindle: Swiss type, automatic screw type – multi spindle:
UNIT III  SHAPER, MILLING AND GEAR CUTTING MACHINES  

UNIT IV  ABRASIVE PROCESS AND BROACHING  
Abrasive processes: grinding wheel – specifications and selection, types of grinding process– cylindrical grinding, surface grinding, centreless grinding and internal grinding- Typical applications – concepts of surface integrity, broaching machines: broach construction – push, pull, surface and continuous broaching machines

UNIT V  CNC MACHINING  
Numerical Control (NC) machine tools – CNC types, constructional details, special features, machining centre, part programming fundamentals CNC – manual part programming – micromachining – wafer machining

OUTCOMES:
- Upon completion of this course, the students can able to understand and compare the functions and applications of different metal cutting tools and also demonstrate the programming in CNC machining.

TEXT BOOKS:

REFERENCES:

ME6403  ENGINEERING MATERIALS AND METALLURGY  
OBJECTIVES:
- To impart knowledge on the structure, properties, treatment, testing and applications of metals and non-metallic materials so as to identify and select suitable materials for various engineering applications.

UNIT I  ALLOYS AND PHASE DIAGRAMS  

UNIT II  HEAT TREATMENT  
Definition – Full annealing, stress relief, recrystallisation and spheroidising – normalising, hardening and Tempering of steel. Isothermal transformation diagrams – cooling curves superimposed on I.T.
diagram CCR – Hardenability, Jominy end quench test - Austempering, Martempering – Case hardening, carburizing, Nitriding, cyaniding, carbonitriding – Flame and Induction hardening – Vacuum and Plasma hardening.

UNIT III  FERROUS AND NON-FERROUS METALS  9

UNIT IV NON-METALLIC MATERIALS  9
Polymers – types of polymer, commodity and engineering polymers – Properties and applications of various thermosetting and thermoplastic polymers (PP, PS, PVC, PMMA, PET, PC, PA, ABS, PI, PAl, PPO, PPS, PEEK, PTFE, Polymers – Urea and Phenol formaldehydes)- Engineering Ceramics – Properties and applications of Al₂O₃, SiC, Si₃N₄, PSZ and SIALON –Composites-Classifications- Metal Matrix and FRP - Applications of Composites.

UNIT V MECHANICAL PROPERTIES AND DEFORMATION MECHANISMS  8

TOTAL : 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to apply the different materials, their processing, heat treatments in suitable application in mechanical engineering fields.

TEXT BOOKS:

REFERENCES:

GE6351 ENVIRONMENTAL SCIENCE AND ENGINEERING  L T P C
3 0 0 3

OBJECTIVES:
To the study of nature and the 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
12
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
10
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
10
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and 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
7
From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization-environmental ethics: Issues and possible solutions – 12 Principles of green chemistry- nuclear

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

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

TEXT BOOKS:

REFERENCES:

ME6404 THERMAL ENGINEERING
OBJECTIVES:
- To integrate the concepts, laws and methodologies from the first course in thermodynamics into analysis of cyclic processes
- To apply the thermodynamic concepts into various thermal application like IC engines, Steam Turbines, Compressors and Refrigeration and Air conditioning systems

(Use of standard refrigerant property data book, Steam Tables, Mollier diagram and Psychrometric chart permitted)
UNIT I  GAS POWER CYCLES  8
Otto, Diesel, Dual, Brayton cycles, Calculation of mean effective pressure, and air standard efficiency - Comparison of cycles.

UNIT II  INTERNAL COMBUSTION ENGINES  10

UNIT III  STEAM NOZZLES AND TURBINES  9
Flow of steam through nozzles, shapes of nozzles, effect of friction, critical pressure ratio, supersaturated flow. Impulse and Reaction principles, compounding, velocity diagram for simple and multi-stage turbines, speed regulations –Governors.

UNIT IV  AIR COMPRESSOR  9
Classification and working principle of various types of compressors, work of compression with and without clearance, Volumetric efficiency, Isothermal efficiency and Isentropic efficiency of reciprocating compressors, Multistage air compressor and inter cooling –work of multistage air compressor

UNIT V  REFRIGERATION AND AIR CONDITIONING  9

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to apply the different gas power cycles and use of them in IC and R&AC applications.

TEXT BOOKS:

REFERENCES:
LIST OF EXPERIMENTS:
1. Contour milling using vertical milling machine
2. Spur gear cutting in milling machine
3. Helical Gear Cutting in milling machine
4. Gear generation in hobbing machine
5. Gear generation in gear shaping machine
6. Plain Surface grinding
7. Cylindrical grinding
8. Tool angle grinding with tool and Cutter Grinder
9. Measurement of cutting forces in Milling / Turning Process
10. CNC Part Programming.

OUTCOMES:
- Ability to use different machine tools to manufacturing gears.
- Ability to use different machine tools for finishing operations
- Ability to manufacture tools using cutter grinder
- Develop CNC part programming

TOTAL : 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Turret and Capstan Lathes</td>
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</tr>
<tr>
<td>2</td>
<td>Horizontal Milling Machine</td>
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</tr>
<tr>
<td>3</td>
<td>Vertical Milling Machine</td>
<td>1 No</td>
</tr>
<tr>
<td>4</td>
<td>Surface Grinding Machine</td>
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</tr>
<tr>
<td>5</td>
<td>Cylindrical Grinding Machine</td>
<td>1 No</td>
</tr>
<tr>
<td>6</td>
<td>Radial Drilling Machine</td>
<td>1 No</td>
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<tr>
<td>7</td>
<td>Lathe Tool Dynamometer</td>
<td>1 No</td>
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<tr>
<td>8</td>
<td>Milling Tool Dynamometer</td>
<td>1 No</td>
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<tr>
<td>9</td>
<td>Gear Hobbing Machine</td>
<td>1 No</td>
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<tr>
<td>10</td>
<td>Tool Makers Microscope</td>
<td>1 No</td>
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<tr>
<td>11</td>
<td>CNC Lathe</td>
<td>1 No</td>
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<tr>
<td>12</td>
<td>CNC Milling machine</td>
<td>1 No</td>
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<tr>
<td>13</td>
<td>Gear Shaping machine</td>
<td>1 No</td>
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<tr>
<td>14</td>
<td>Centerless grinding machine</td>
<td>1 No</td>
</tr>
<tr>
<td>15</td>
<td>Tool and cutter grinder</td>
<td>1 No</td>
</tr>
</tbody>
</table>

ME6412 THERMAL ENGINEERING LABORATORY – I

OBJECTIVES:
- To study the value timing-V diagram and performance of IC Engines
- To Study the characteristics of fuels/Lubricates used in IC Engines
- To study the Performance of steam generator/ turbine
LIST OF EXPERIMENTS

I.C. ENGINE LAB 30
2. Actual p-v diagrams of IC engines.
5. Morse Test on Multi-cylinder Petrol Engine.
6. Retardation Test on a Diesel Engine.
7. Determination of Flash Point and Fire Point of various fuels / lubricants.

STEAM LAB 15
1. Study on Steam Generators and Turbines.

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to conduct experiment on IC engine to study the characteristic and performance of IC design/ steam turbines.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>I.C Engine – 2 stroke and 4 stroke model</td>
<td>1 set</td>
</tr>
<tr>
<td>2</td>
<td>Apparatus for Flash and Fire Point</td>
<td>1 No.</td>
</tr>
<tr>
<td>3</td>
<td>4-stroke Diesel Engine with mechanical loading.</td>
<td>1 No.</td>
</tr>
<tr>
<td>4</td>
<td>4-stroke Diesel Engine with hydraulic loading.</td>
<td>1 No.</td>
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<tr>
<td>5</td>
<td>4-stroke Diesel Engine with electrical loading.</td>
<td>1 No.</td>
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<tr>
<td>6</td>
<td>Multi-cylinder Petrol Engine</td>
<td>1 No.</td>
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<tr>
<td>7</td>
<td>Single cylinder Petrol Engine</td>
<td>1 No.</td>
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<tr>
<td>8</td>
<td>Data Acquisition system with any one of the above engines</td>
<td>1 No.</td>
</tr>
<tr>
<td>9</td>
<td>Steam Boiler with turbine setup</td>
<td>1 No.</td>
</tr>
</tbody>
</table>

CE6315 STRENGTH OF MATERIALS LABORATORY 0032

OBJECTIVES
To supplement the theoretical knowledge gained in Mechanics of Solids with practical testing for determining the strength of materials under externally applied loads. This would enable the student to have a clear understanding of the design for strength and stiffness.

LIST OF EXPERIMENTS
1. Tension test on a mild steel rod
2. Double shear test on Mild steel and Aluminium rods
3. Torsion test on mild steel rod
4. Impact test on metal specimen
5. Hardness test on metals - Brinnell and Rockwell Hardness Number
6. Deflection test on beams
7. Compression test on helical springs
8. Strain Measurement using Rosette strain gauge
10. Tempering- Improvement Mechanical properties Comparison
(i) Unhardened specimen  
(ii) Quenched Specimen and  
(iii) Quenched and tempered specimen.  

11. Microscopic Examination of  
(i) Hardened samples and  
(ii) Hardened and tempered samples.  

TOTAL: 45 PERIODS

OUTCOMES:  
- Ability to perform different destructive testing  
- Ability to characteristic materials

LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Universal Tensile Testing machine with double 1 shear attachment – 40 Ton Capacity</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Torsion Testing Machine (60 NM Capacity)</td>
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<tr>
<td>3</td>
<td>Impact Testing Machine (300 J Capacity)</td>
<td>1</td>
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<td>4</td>
<td>Brinell Hardness Testing Machine</td>
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<td>5</td>
<td>Rockwell Hardness Testing Machine</td>
<td>1</td>
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<tr>
<td>6</td>
<td>Spring Testing Machine for tensile and compressive loads (2500 N)</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Metallurgical Microscopes</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Muffle Furnace (800 C)</td>
<td>1</td>
</tr>
</tbody>
</table>

ME6501 COMPUTER AIDED DESIGN

OBJECTIVES:  
- To provide an overview of how computers are being used in mechanical component design

UNIT I FUNDAMENTALS OF COMPUTER GRAPHICS
Product cycle- Design process- sequential and concurrent engineering- Computer aided design – CAD system architecture- Computer graphics – co-ordinate systems- 2D and 3D transformations- homogeneous coordinates - Line drawing -Clipping- viewing transformation

UNIT II GEOMETRIC MODELING
Representation of curves- Hermite curve- Bezier curve- B-spline curves-rational curves-Techniques for surface modeling – surface patch- Coons and bicubic patches- Bezier and B-spline surfaces. Solid modeling techniques- CSG and B-rep

UNIT III VISUAL REALISM

UNIT IV ASSEMBLY OF PARTS
Assembly modellng – interferences of positions and orientation – tolerance analysis-massproperty calculations – mechanism simulation and interference checking.

UNIT V CAD STANDARDS
Standards for computer graphics - **Graphical Kernel System** (GKS) - standards for exchange images - **Open Graphics Library (OpenGL)** - Data exchange standards - IGES, STEP, CALS etc. - communication standards.

**OUTCOMES:**
- Upon completion of this course, the students can able to use computer and CAD software’s for modeling of mechanical components

**TEXT BOOKS:**

**REFERENCES:**

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**ME6502 HEAT AND MASS TRANSFER**

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</table>

**OBJECTIVES:**
- To understand the mechanisms of heat transfer under steady and transient conditions.
- To understand the concepts of heat transfer through extended surfaces.
- To learn the thermal analysis and sizing of heat exchangers and to understand the basic concepts of mass transfer.

(Use of standard HMT data book permitted)

**UNIT I CONDUCTION**

**UNIT II CONVECTION**

**UNIT III PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS**

**UNIT IV RADIATION**

**UNIT V MASS TRANSFER**

51

TOTAL : 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to understand and apply different heat and mass transfer principles of different applications.

TEXT BOOK:

REFERENCE BOOKS:

ME6503 DESIGN OF MACHINE ELEMENTS L T P C
3 0 0 3

OBJECTIVES
• To familiarize the various steps involved in the Design Process
• To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.
• To learn to use standard practices and standard data
• To learn to use catalogues and standard machine components (Use of P S G Design Data Book is permitted)

UNIT I STEADY STRESSES AND VARIABLE STRESSES IN MACHINE MEMBERS 10

UNIT II SHAFTS AND COUPLINGS 8
Design of solid and hollow shafts based on strength, rigidity and critical speed – Keys, keyways and splines - Rigid and flexible couplings.

UNIT III TEMPORARY AND PERMANENT JOINTS 9

52
Threaded fasteners - Bolted joints including eccentric loading, Knuckle joints, Cotter joints – Welded joints, riveted joints for structures - theory of bonded joints.

UNIT IV ENERGY STORING ELEMENTS AND ENGINE COMPONENTS 9
Various types of springs, optimization of helical springs - rubber springs - Flywheels considering stresses in rims and arms for engines and punching machines- Connecting Rods and crank shafts.

UNIT V BEARINGS 9
Sliding contact and rolling contact bearings - Hydrodynamic journal bearings, Sommerfeld Number, Raimondi and Boyd graphs, -- Selection of Rolling Contact bearings.

OUTCOMES:
• Upon completion of this course, the students can able to successfully design machine components

TEXT BOOK:

REFERENCES:

ME6504 METROLOGY AND MEASUREMENTS

OBJECTIVES:
• To provide knowledge on various Metrological equipments available to measure the dimension of the components.
• To provide knowledge on the correct procedure to be adopted to measure the dimension of the components.

UNIT I BASICS OF METROLOGY 5

UNIT II LINEAR AND ANGULAR MEASUREMENTS 10

UNIT III  ADVANCES IN METROLOGY  12

UNIT IV  FORM MEASUREMENT  10
Principles and Methods of straightness – Flatness measurement – Thread measurement, gear measurement, surface finish measurement, Roundness measurement – Applications.

UNIT V  MEASUREMENT OF POWER, FLOW AND TEMPERATURE  8

TOTAL : 45 PERIODS

OUTCOMES:
• Upon completion of this course, the Students can demonstrate different measurement technologies and use of them in Industrial Components

TEXT BOOKS:

REFERENCES:

UNIT III SINGLE DEGREE FREE VIBRATION


UNIT IV FORCED VIBRATION


UNIT V MECHANISM FOR CONTROL


TOTAL : 45 PERIODS

OUTCOMES:
• Upon completion of this course, the Students can able to predict the force analysis in mechanical system and related vibration issues and can able to solve the problem

TEXT BOOK:

REFERENCES:
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

UNIT II ENGINEERING ETHICS

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS

UNIT V GLOBAL ISSUES

TOTAL: 45 PERIODS

OUTCOMES:
- 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:
6. World Community Service Centre, " Value Education", Vethathiri publications, Erode, 2011

Web sources:
ME6511 DYNAMICS LABORATORY

OBJECTIVES:
• To supplement the principles learnt in kinematics and Dynamics of Machinery.
• To understand how certain measuring devices are used for dynamic testing.

LIST OF EXPERIMENTS
1. a) Study of gear parameters.
   b) Experimental study of velocity ratios of simple, compound, Epicyclic and differential gear trains.
2. a) Kinematics of Four Bar, Slider Crank, Crank Rocker, Double crank, Double rocker, Oscillating cylinder Mechanisms.
   b) Kinematics of single and double universal joints.
3. a) Determination of Mass moment of inertia of Fly wheel and Axle system.
   b) Determination of Mass Moment of Inertia of axisymmetric bodies using Turn Table apparatus.
   c) Determination of Mass Moment of Inertia using bifilar suspension and compound pendulum.
4. Motorized gyroscope – Study of gyroscopic effect and couple.
5. Governor - Determination of range sensitivity, effort etc., for Watts, Porter, Proell, and Hartnell Governors.
6. Cams – Cam profile drawing, Motion curves and study of jump phenomenon
   b) Multi degree freedom suspension system – Determination of influence coefficient.
8. a) Determination of torsional natural frequency of single and Double Rotor systems.- Undamped and Damped Natural frequencies.
   b) Vibration Absorber – Tuned vibration absorber.
9. Vibration of Equivalent Spring mass system – undamped and damped vibration.
11. a) Balancing of rotating masses. (b) Balancing of reciprocating masses.
12. a) Transverse vibration of Free-Free beam – with and without concentrated masses.
   b) Forced Vibration of Cantilever beam – Mode shapes and natural frequencies.
   c) Determination of transmissibility ratio using vibrating table.

TOTAL : 45 PERIODS

OUTCOME
• Ability to demonstrate the principles of kinematics and dynamics of machinery
• Ability to use the measuring devices for dynamic testing.
# LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Cam follower setup.</td>
<td>1 No.</td>
</tr>
<tr>
<td>2</td>
<td>Motorised gyroscope.</td>
<td>1 No.</td>
</tr>
<tr>
<td>3</td>
<td>Governor apparatus - Watt, Porter, Proell and Hartnell governors.</td>
<td>1 No.</td>
</tr>
<tr>
<td>4</td>
<td>Whirling of shaft apparatus.</td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td>Dynamic balancing machine.</td>
<td>1 No.</td>
</tr>
<tr>
<td>6</td>
<td>Two rotor vibration setup.</td>
<td>1 No.</td>
</tr>
<tr>
<td>7</td>
<td>Spring mass vibration system.</td>
<td>1 No.</td>
</tr>
<tr>
<td>8</td>
<td>Torsional Vibration of single rotor system setup.</td>
<td>1 No.</td>
</tr>
<tr>
<td>9</td>
<td>Gear Models</td>
<td>1 No.</td>
</tr>
<tr>
<td>10</td>
<td>Kinematic Models to study various mechanisms.</td>
<td>1 No.</td>
</tr>
<tr>
<td>11</td>
<td>Turn table apparatus.</td>
<td>1 No.</td>
</tr>
<tr>
<td>12</td>
<td>Transverse vibration setup of</td>
<td>1 No.</td>
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<tr>
<td></td>
<td>a) cantilever</td>
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<tr>
<td></td>
<td>b) Free-Free beam</td>
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<td></td>
<td>c) Simply supported beam.</td>
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</tbody>
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**ME6512**  
**THERMAL ENGINEERING LABORATORY – II**  
**L T P C**  
**0 0 3 2**

**OBJECTIVES**
- To study the heat transfer phenomena predict the relevant coefficient using implementation
- To study the performance of refrigeration cycle / components

**LIST OF EXPERIMENTS:**

### HEAT TRANSFER LAB:

1. Thermal conductivity measurement using guarded plate apparatus.
2. Thermal conductivity measurement of pipe insulation using lagged pipe apparatus.
3. Determination of heat transfer coefficient under natural convection from a vertical cylinder.
4. Determination of heat transfer coefficient under forced convection from a tube.
5. Determination of Thermal conductivity of composite wall.
6. Determination of Thermal conductivity of insulating powder.
7. Heat transfer from pin-fin apparatus (natural & forced convection modes)
8. Determination of Stefan – Boltzmann constant.
10. Effectiveness of Parallel / counter flow heat exchanger.

### REFRIGERATION AND AIR CONDITIONING LAB

1. Determination of COP of a refrigeration system
2. Experiments on Psychrometric processes
3. Performance test on a reciprocating air compressor
4. Performance test in a HC Refrigeration System
5. Performance test in a fluidized Bed Cooling Tower

**TOTAL: 45 PERIODS**
OUTCOMES

- Ability to demonstrate the fundamentals of heat and predict the coefficient used in that transfer application and also design refrigeration cycle.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Guarded plate apparatus</td>
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<tr>
<td>2</td>
<td>Lagged pipe apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>3</td>
<td>Natural convection-vertical cylinder apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>4</td>
<td>Forced convection inside tube apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td>Composite wall apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>6</td>
<td>Thermal conductivity of insulating powder apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>7</td>
<td>Pin-fin apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>8</td>
<td>Stefan-Boltzmann apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>9</td>
<td>Emissivity measurement apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>10</td>
<td>Parallel/counter flow heat exchanger apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>11</td>
<td>Single/two stage reciprocating air compressor</td>
<td>1 No.</td>
</tr>
<tr>
<td>12</td>
<td>Refrigeration test rig</td>
<td>1 No.</td>
</tr>
<tr>
<td>13</td>
<td>Air-conditioning test rig</td>
<td>1 No.</td>
</tr>
</tbody>
</table>

ME6513 METROLOGY AND MEASUREMENTS LABORATORY

OBJECTIVES

- To familiar with different measurement equipments and use of this industry for quality inspection

LIST OF EXPERIMENTS

1. Tool Maker’s Microscope
2. Comparator
3. Sine Bar
4. Gear Tooth Vernier Caliper
5. Floating gauge Micrometer
6. Co ordinate Measuring Machine
7. Surface Finish Measuring Equipment
8. Vernier Height Gauge
9. Bore diameter measurement using telescope gauge
10. Bore diameter measurement using micrometer
11. Force Measurement
12. Torque Measurement
13. Temperature measurement
14. Autocollimator

TOTAL: 45 PERIODS

OUTCOMES

- Ability to handle different measurement tools and perform measurements in quality impulse
**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Micrometer</td>
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</tr>
<tr>
<td>2</td>
<td>Vernier Caliper</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Vernier Height Gauge</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Vernier depth Gauge</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Slip Gauge Set</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Gear Tooth Vernier</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Sine Bar</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Floating Carriage Micrometer</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Profile Projector / Tool Makers Microscope</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Parallel / counter flow heat exchanger apparatus</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Mechanical / Electrical / Pneumatic Comparator</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Autocollimator</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>Temperature Measuring Setup</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>Force Measuring Setup</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>Torque Measuring Setup</td>
<td>1</td>
</tr>
<tr>
<td>16</td>
<td>Coordinate measuring machine</td>
<td>1</td>
</tr>
<tr>
<td>17</td>
<td>Surface finish measuring equipment</td>
<td>1</td>
</tr>
<tr>
<td>18</td>
<td>Bore gauge</td>
<td>1</td>
</tr>
<tr>
<td>19</td>
<td>Telescope gauge</td>
<td>1</td>
</tr>
</tbody>
</table>

**ME6601 DESIGN OF TRANSMISSION SYSTEMS**

**OBJECTIVES:**
- To gain knowledge on the principles and procedure for the design of Mechanical power Transmission components.
- To understand the standard procedure available for Design of Transmission of Mechanical elements
- To learn to use standard data and catalogues
  (Use of P S G Design Data Book permitted)

**UNIT I   DESIGN OF FLEXIBLE ELEMENTS**
Design of Flat belts and pulleys - Selection of V belts and pulleys – Selection of hoisting wire ropes and pulleys – Design of Transmission chains and Sprockets.

**UNIT II SPUR GEARS AND PARALLEL AXIS HELICAL GEARS**
Speed ratios and number of teeth-Force analysis -Tooth stresses - Dynamic effects – Fatigue strength - Factor of safety - Gear materials – Design of straight tooth spur & helical gears based on strength and wear considerations – Pressure angle in the normal and transverse plane- Equivalent number of teeth-forces for helical gears.

**UNIT III BEVEL, WORM AND CROSS HELICAL GEARS**
UNIT IV GEAR BOXES
Geometric progression - Standard step ratio - Ray diagram, kinematics layout - Design of sliding mesh
gear box - Design of multi speed gear box for machine tool applications - Constant mesh gear box -
Speed reducer unit. – Variable speed gear box, Fluid Couplings, Torque Converters for automotive
applications.

UNIT V CAMS, CLUTCHES AND BRAKES
Cam Design: Types-pressure angle and under cutting base circle determination-forces and surface
stresses. Design of plate clutches –axial clutches-cone clutches-internal expanding rim clutches-
Electromagnetic clutches. Band and Block brakes - external shoe brakes – Internal expanding shoe
brake.

OUTCOMES:
• Upon completion of this course, the students can able to successfully design transmission
components used in Engine and machines

TEXT BOOKS:
2. Joseph Shigley, Charles Mischke, Richard Budynas and Keith Nisbett “Mechanical

REFERENCES:
2003.
2005
BookCo.(Schaum's Outline), 2010

MG6851 PRINCIPLES OF MANAGEMENT
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:
OBJECTIVES:
- To understand the construction and working principle of various parts of an automobile.
- To have the practice for assembling and dismantling of engine parts and transmission system

UNIT I VEHICLE STRUCTURE AND ENGINES
Types of automobiles, vehicle construction and different layouts, chassis, frame and body, Vehicle aerodynamics (various resistances and moments involved), IC engines – components-functions and materials, variable valve timing (VVT).

UNIT II ENGINE AUXILIARY SYSTEMS
Electronically controlled gasoline injection system for SI engines, Electronically controlled diesel injection system (Unit injector system, Rotary distributor type and common rail direct injection system), Electronic ignition system (Transistorized coil ignition system, capacitive discharge ignition system), Turbo chargers (WGT, VGT), Engine emission control by three way catalytic converter system, Emission norms (Euro and BS).

UNIT III TRANSMISSION SYSTEMS
Clutch-types and construction, gear boxes- manual and automatic, gear shift mechanisms, Over drive, transfer box, fluid flywheel, torque converter, propeller shaft, slip joints, universal joints ,Differential and rear axle, Hotchkiss Drive and Torque Tube Drive.

UNIT IV STEERING, BRAKES AND SUSPENSION SYSTEMS
Steering geometry and types of steering gear box-Power Steering, Types of Front Axle, Types of Suspension Systems, Pneumatic and Hydraulic Braking Systems, Antilock Braking System (ABS), electronic brake force distribution (EBD) and Traction Control.

UNIT V ALTERNATIVE ENERGY SOURCES

Note: Practical Training in dismantling and assembling of Engine parts and Transmission Systems should be given to the students.

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students will be able to identify the different components in automobile engineering.
- Have clear understanding on different auxiliary and transmission systems usual.

TEXT BOOKS:

REFERENCES:

<table>
<thead>
<tr>
<th>ME6603</th>
<th>FINITE ELEMENT ANALYSIS</th>
<th>L T P C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>3 0 0 3</td>
</tr>
</tbody>
</table>

**OBJECTIVES:**
- To introduce the concepts of Mathematical Modeling of Engineering Problems.
- To appreciate the use of FEM to a range of Engineering Problems.

**UNIT I  INTRODUCTION**
9

**UNIT II  ONE-DIMENSIONAL PROBLEMS**
9

**UNIT III  TWO DIMENSIONAL SCALAR VARIABLE PROBLEMS**
9

**UNIT IV  TWO DIMENSIONAL VECTOR VARIABLE PROBLEMS**
9
Equations of elasticity – Plane stress, plane strain and axisymmetric problems – Body forces and temperature effects – Stress calculations - Plate and shell elements.

**UNIT V  ISOPARAMETRIC FORMULATION**
9

**TOTAL : 45 PERIODS**

**OUTCOMES:**
- Upon completion of this course, the students can able to understand different mathematical Techniques used in FEM analysis and use of them in Structural and thermal problem

**TEXT BOOK:**
REFERENCES:

ME6604 GAS DYNAMICS AND JET PROPULSION

OBJECTIVES:
- To understand the basic difference between incompressible and compressible flow.
- To understand the phenomenon of shock waves and its effect on flow. To gain some basic knowledge about jet propulsion and Rocket Propulsion.
  (Use of Standard Gas Tables permitted)

UNIT I BASIC CONCEPTS AND ISENTROPIC FLOWS
Energy and momentum equations of compressible fluid flows – Stagnation states, Mach waves and Mach cone – Effect of Mach number on compressibility – Isentropic flow through variable ducts – Nozzle and Diffusers

UNIT II FLOW THROUGH DUCTS
Flows through constant area ducts with heat transfer (Rayleigh flow) and Friction (Fanno flow) – variation of flow properties.

UNIT III NORMAL AND OBLIQUE SHOCKS
Governing equations – Variation of flow parameters across the normal and oblique shocks – Prandtl – Meyer relations – Applications.

UNIT IV JET PROPULSION
Theory of jet propulsion – Thrust equation – Thrust power and propulsive efficiency – Operating principle, cycle analysis and use of stagnation state performance of ram jet, turbojet, turbofan and turbo prop engines.

UNIT V SPACE PROPULSION

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to successfully apply gas dynamics principles in the Jet and Space Propulsion
TEXT BOOKS:

REFERENCES:

ME6611 CAD / CAM LABORATORY

OBJECTIVES:
• To gain practical experience in handling 2D drafting and 3D modelling software systems.
• To study the features of CNC Machine Tool.
• To expose students to modern control systems (Fanuc, Siemens etc.,)
• To know the application of various CNC machines like CNC lathe, CNC Vertical Machining centre, CNC EDM and CNC wire-cut and studying of Rapid prototyping.

LIST OF EXPERIMENTS

1. 3D GEOMETRIC MODELLING
24 PERIODS

List of Experiments
  1. Introduction of 3D Modelling software

Creation of 3D assembly model of following machine elements using 3D Modelling software
  2. Flange Coupling
  3. Plummer Block
  4. Screw Jack
  5. Lathe Tailstock
  6. Universal Joint
  7. Machine Vice
  8. Stuffing box
  9. Crosshead
  10. Safety Valves
  11. Non-return valves
  12. Connecting rod
  13. Piston
14. Crankshaft
* Students may also be trained in manual drawing of some of the above components

(i) Part Programming - CNC Machining Centre
a) Linear Cutting.
b) Circular cutting.
c) Cutter Radius Compensation.
d) Canned Cycle Operations.
(ii) Part Programming - CNC Turning Centre
a) Straight, Taper and Radius Turning.
b) Thread Cutting.
c) Rough and Finish Turning Cycle.
d) Drilling and Tapping Cycle.

3. Computer Aided Part Programming
e) CL Data and Post process generation using CAM packages.
f) Application of CAPP in Machining and Turning Centre.

TOTAL: 45 PERIODS

OUTCOMES
• Ability to develop 2D and 3D models using modeling softwares.
• Ability to understand the CNC control in modern manufacturing system.
• Ability to prepare CNC part programming and perform manufacturing.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description of Equipment</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>HARDWARE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Computer Server</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>Computer nodes or systems (High end CPU with atleast 1 GB main memory) networked to the server</td>
<td>30</td>
</tr>
<tr>
<td>3.</td>
<td>A3 size plotter</td>
<td>1</td>
</tr>
<tr>
<td>4.</td>
<td>Laser Printer</td>
<td>1</td>
</tr>
<tr>
<td>5.</td>
<td>CNC Lathe</td>
<td>1</td>
</tr>
<tr>
<td>6.</td>
<td>CNC milling machine</td>
<td>1</td>
</tr>
<tr>
<td>SOFTWARE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Any High end integrated modeling and manufacturing CAD / CAM software</td>
<td>15 licenses</td>
</tr>
<tr>
<td>8.</td>
<td>CAM Software for machining centre and turning centre (CNC Programming and tool path simulation for FANUC / Sinumeric and Heidenhain controller)</td>
<td>15 licenses</td>
</tr>
<tr>
<td>9.</td>
<td>Licensed operating system</td>
<td>Adequate</td>
</tr>
<tr>
<td>10.</td>
<td>Support for CAPP</td>
<td>Adequate</td>
</tr>
</tbody>
</table>
OBJECTIVES:
- The main objective is to give an opportunity to the student to get hands on training in the fabrication of one or more components of a complete working model, which is designed by them.

GUIDELINE FOR REVIEW AND EVALUATION
The students may be grouped into 2 to 4 and work under a project supervisor. The device/system/component(s) to be fabricated may be decided in consultation with the supervisor and if possible with an industry. A project report to be submitted by the group and the fabricated model, which will be reviewed and evaluated for internal assessment by a Committee constituted by the Head of the Department. At the end of the semester examination 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.

OUTCOMES:
- Use of design principles and develop conceptual and engineering design of any components.
- Ability to fabricate any components using different manufacturing tools.

OBJECTIVES:
- To provide opportunities to learners to practice their communicative skills to make them become proficient users of English.
- To enable learners to fine-tune their linguistic skills (LSRW) with the help of technology to communicate globally.
- To enhance the performance of learners at placement interviews and group discussions and other recruitment procedures.

UNIT I LISTENING / VIEWING
Listening and note-taking – Listening to telephonic conversations – Ted talks – Inspiring Speeches – Watching documentaries on personalities, places, socio-cultural events, TV news programmes and discussions to answer different kinds questions, viz., identifying key idea and comprehension questions… so on.

UNIT II SPEAKING

UNIT III READING
Different genres of text (literature, media, technical) for comprehension – Reading strategies like note-making – reading graphs, charts and graphic organizer – Sequencing sentences – reading online sources like e-books, e-journals and e-newspapers.

UNIT IV WRITING
UNIT V VOCABULARY

Idioms and Phrases – Proverbs – Collocations – Chunks of language.

UNIT VI GRAMMAR

Sentence structures – Subject-Verb agreement – Pronoun-Antecedent agreement – Tense forms – Active and passive voices – Direct and Indirect speeches – Cohesive devices.

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>Server</td>
<td>1 No.</td>
</tr>
<tr>
<td></td>
<td>• PIV System</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 1 GB RAM / 40 GB HDD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• OS: Win 2000 server</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Audio card with headphones</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• JRE 1.3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Client Systems</td>
<td>60 Nos.</td>
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<tr>
<td></td>
<td>• PIII System</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 256 or 512 MB RAM / 40 GB HDD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• OS: Win 2000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Audio card with headphones</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• JRE 1.3</td>
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<tr>
<td>3</td>
<td>Handicam</td>
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<tr>
<td>5</td>
<td>Collar mike</td>
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<tr>
<td>6</td>
<td>Cordless mike</td>
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</tr>
<tr>
<td>7</td>
<td>Audio Mixer</td>
<td>1 No.</td>
</tr>
<tr>
<td>8</td>
<td>DVD recorder/player</td>
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</tr>
<tr>
<td>9</td>
<td>LCD Projector with MP3/CD/DVD provision for</td>
<td>1 No.</td>
</tr>
<tr>
<td></td>
<td>Audio/video facility</td>
<td></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**
- Online Test - 35 marks
- Interview - 15 marks
- Presentation - 15 marks
- Group Discussion - 15 marks

**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, case studies and abstract concept

**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:**

**Web Sources:**
www.humanresources.about.com
www.careerride.com

**ME6701 POWER PLANT ENGINEERING**

**OBJECTIVES:**
- Providing an overview of Power Plants and detailing the role of Mechanical Engineers in their operation and maintenance.

**UNIT I COAL BASED THERMAL POWER PLANTS**
UNIT II    DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS      10

UNIT III    NUCLEAR POWER PLANTS                                7

UNIT IV    POWER FROM RENEWABLE ENERGY                          10
Hydro Electric Power Plants – Classification, Typical Layout and associated components including Turbines. Principle, Construction and working of Wind, Tidal, Solar Photo Voltaic (SPV), Solar Thermal, Geo Thermal, Biogas and Fuel Cell power systems.

UNIT V     ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS      8
Power tariff types, Load distribution parameters, load curve, Comparison of site selection criteria, relative merits & demerits, Capital & Operating Cost of different power plants. Pollution control technologies including Waste Disposal Options for Coal and Nuclear Power Plants.

TOTAL : 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to understand different types of power plant, and its functions and their flow lines and issues related to them.
• Analyse and solve energy and economic related issues in power sectors.

TEXT BOOK:

REFERENCES:

ME6702     MECHATRONICS                                          L T P C
                                              3 0 0 3

OBJECTIVES:
• To impart knowledge about the elements and techniques involved in Mechatronics systems which are very much essential to understand the emerging field of automation.

UNIT I     INTRODUCTION                                          12
sensors – Strain gauges – Eddy current sensor – Hall effect sensor – Temperature sensors – Light sensors

**UNIT II  8085 MICROPROCESSOR AND 8051 MICROCONTROLLER**  
**Introduction – Architecture of 8085 – Pin Configuration – Addressing Modes – Instruction set, Timing diagram of 8085 – Concepts of 8051 microcontroller – Block diagram.**

**UNIT III  PROGRAMMABLE PERIPHERAL INTERFACE**  
**Introduction – Architecture of 8255, Keyboard interfacing, LED display – interfacing, ADC and DAC interface, Temperature Control – Stepper Motor Control – Traffic Control interface.**

**UNIT IV  PROGRAMMABLE LOGIC CONTROLLER**  
**Introduction – Basic structure – Input and output processing – Programming – Mnemonics – Timers, counters and internal relays – Data handling – Selection of PLC.**

**UNIT V  ACTUATORS AND MECHATRONIC SYSTEM DESIGN**  

**OUTCOMES:**  
- Upon completion of this course, the students can able to design mechatronics system with the help of Microprocessor, PLC and other electrical and Electronics Circuits.

**TEXT BOOKS:**

**REFERENCES:**

**ME6703  COMPUTER INTEGRATED MANUFACTURING SYSTEMS**  
**OBJECTIVES:**
- To understand the application of computers in various aspects of Manufacturing viz., Design, Proper planning, Manufacturing cost, Layout & Material Handling system.
UNIT I  INTRODUCTION

UNIT II  PRODUCTION PLANNING AND CONTROL AND COMPUTERISED PROCESS PLANNING

UNIT III  CELLULAR MANUFACTURING

UNIT IV  FLEXIBLE MANUFACTURING SYSTEM (FMS) AND AUTOMATED GUIDED VEHICLE SYSTEM (AGVS)

UNIT V  INDUSTRIAL ROBOTICS

OUTCOMES:
• Upon completion of this course, the student can able to understand the use of computers in process planning and use of FMS and Robotics in CIM

TEXT BOOK:

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

UNIT I INTRODUCTION

UNIT II TQM PRINCIPLES
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
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

UNIT V QUALITY SYSTEMS

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

TEXT BOOK:

REFERENCES:
OBJECTIVES:
• To give exposure to software tools needed to analyze engineering problems.
• To expose the students to different applications of simulation and analysis tools.

LIST OF EXPERIMENTS

A. SIMULATION
1. MATLAB basics, Dealing with matrices, Graphing-Functions of one variable and two variables
2. Use of Matlab to solve simple problems in vibration
3. Mechanism Simulation using Multibody Dynamic software

B. ANALYSIS
1. Force and Stress analysis using link elements in Trusses, cables etc.
2. Stress and deflection analysis in beams with different support conditions.
3. Stress analysis of flat plates and simple shells.
5. Thermal stress and heat transfer analysis of plates.
7. Vibration analysis of spring-mass systems.
8. Model analysis of Beams.
9. Harmonic, transient and spectrum analysis of simple systems.

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of this course, the Students can model, analyse and simulate experiments to meet real world system and evaluate the performance.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S. NO.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Computer Work Station</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>Color Desk Jet Printer</td>
<td>01</td>
</tr>
<tr>
<td>3</td>
<td>Multibody Dynamic Software Suitable for Mechanism</td>
<td>15 licenses</td>
</tr>
<tr>
<td></td>
<td>simulation and analysis</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>C / MATLAB</td>
<td>5 licenses</td>
</tr>
</tbody>
</table>

ME6712  MECHATRONICS LABORATORY  L T P C  0 0 3 2

OBJECTIVES:
• To know the method of programming the microprocessor and also the design, modeling & analysis of basic electrical, hydraulic & pneumatic Systems which enable the students to understand the concept of mechatronics.

LIST OF EXPERIMENTS:
2. Stepper motor interface.
4. Speed control of DC motor.
5. Study of various types of transducers.
7. Modelling and analysis of basic hydraulic, pneumatic and electrical circuits using Software.
8. Study of PLC and its applications.
9. Study of image processing technique.

TOTAL : 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to design mechatronics system with the help of Microprocessor, PLC and other electrical and Electronics Circuits.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Basic Pneumatic Trainer Kit with manual and electrical controls/ PLC Control each</td>
<td>1 No.</td>
</tr>
<tr>
<td>2</td>
<td>Basic Hydraulic Trainer Kit</td>
<td>1 No.</td>
</tr>
<tr>
<td>3</td>
<td>Hydraulics and Pneumatics Systems Simulation Software</td>
<td>10 No</td>
</tr>
<tr>
<td>4</td>
<td>8051 - Microcontroller kit with stepper motor and drive circuit sets</td>
<td>2 No.</td>
</tr>
<tr>
<td></td>
<td>Image processing system with hardware &amp; software</td>
<td>1 No.</td>
</tr>
</tbody>
</table>

ME6713    COMPREHENSION

OBJECTIVES:
• To encourage the students to comprehend the knowledge acquired from the first Semester to Sixth Semester of B.E Degree Course through periodic exercise.

METHOD OF EVALUATION:
The students will be assessed 100% internally through weekly test with objective type questions on all the subject related topics

TOTAL : 30 PERIODS

OUTCOMES:
• ability to understand and comprehend any given problem related to mechanical engineering field.

MG6863    ENGINEERING ECONOMICS

OBJECTIVES:
• To enable students to understand the fundamental economic concepts applicable to engineering and to learn the techniques of incorporating inflation factor in economic decision making.
UNIT I INTRODUCTION TO ECONOMICS 8

UNIT II VALUE ENGINEERING 10
Make or buy decision, Value engineering – Function, aims, Value engineering procedure. Interest formulae and their applications –Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor- equal payment series capital recovery factor - Uniform gradient series annual equivalent factor, Effective interest rate, Examples in all the methods.

UNIT III CASH FLOW 9
Methods of comparison of alternatives – present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), Annual equivalent method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), rate of return method, Examples in all the methods.

UNIT IV REPLACEMENT AND MAINTENANCE ANALYSIS 9
Replacement and Maintenance analysis – Types of maintenance, types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset – capital recovery with return and concept of challenger and defender, Simple probabilistic model for items which fail completely.

UNIT V DEPRECIATION 9

TOTAL: 45 PERIODS

OUTCOMES:
- Upon successful completion of this course, students will acquire the skills to apply the basics of economics and cost analysis to engineering and take economically sound decisions.

TEXT BOOKS:

REFERENCES:
ME6811 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.

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.

TOTAL: 180 PERIODS

MG6072 MARKETING MANAGEMENT

OBJECTIVES:
- To enable students to deal with newer concepts of marketing concepts like strategic marketing segmentation, pricing, advertisement and strategic formulation. The course will enable a student to take up marketing as a professional career.

UNIT I MARKETING PROCESS 9
Definition, Marketing process, dynamics, needs, wants and demands, marketing concepts, environment, mix, types. Philosophies, selling versus marketing, organizations, industrial versus consumer marketing, consumer goods, industrial goods, product hierarchy.

UNIT II BUYING BEHAVIOUR AND MARKET SEGMENTATION 9
Cultural, demographic factors, motives, types, buying decisions, segmentation factors - demographic - Psycho graphic and geographic segmentation, process, patterns.

UNIT III PRODUCT PRICING AND MARKETING RESEARCH 9
Objectives, pricing, decisions and pricing methods, pricing management. Introduction, uses, process of marketing research.

UNIT IV MARKETING PLANNING AND STRATEGY FORMULATION 9
Components of marketing plan-strategy formulations and the marketing process, implementations, portfolio analysis, BCG, GEC grids.

UNIT V ADVERTISING, SALES PROMOTION AND DISTRIBUTION 9

TOTAL: 45 PERIODS
OUTCOMES:
• The learning skills of Marketing will enhance the knowledge about Marketer’s Practices and create insights on Advertising, Branding, Retailing and Marketing Research.

TEXT BOOKS:

REFERENCES:

ME6001 QUALITY CONTROL AND RELIABILITY ENGINEERING

OBJECTIVES:
• To introduce the concept of SQC
• To understand process control and acceptance sampling procedure and their application.
• To learn the concept of reliability.

UNIT I INTRODUCTION AND PROCESS CONTROL FOR VARIABLES
Introduction, definition of quality, basic concept of quality, definition of SQC, benefits and limitation of SQC, Quality assurance, Quality control: Quality cost-Variation in process causes of variation –Theory of control chart- uses of control chart – Control chart for variables – X chart, R chart and chart -process capability – process capability studies and simple problems. Six sigma concepts

UNIT II PROCESS CONTROL FOR ATTRIBUTES
Control chart for attributes –control chart for non conformings– p chart and np chart – control chart for nonconformities– C and U charts, State of control and process out of control identification in charts, pattern study.

UNIT III ACCEPTANCE SAMPLING

UNIT IV LIFE TESTING – RELIABILITY
UNIT V QUALITY AND RELIABILITY

Note: Use of approved statistical table permitted in the examination.

TOTAL: 45 PERIODS

OUTCOMES:
• Upon successful completion of this course, the students can able to apply the concept of SQC in process control for reliable component production

TEXT BOOKS:

REFERENCES:

ME6002 REFRIGERATION AND AIR CONDITIONING

OBJECTIVES:
• To understand the underlying principles of operations in different Refrigeration & Air conditioning systems and components.
• To provide knowledge on design aspects of Refrigeration & Air conditioning systems

UNIT I INTRODUCTION
Introduction to Refrigeration - Unit of Refrigeration and C.O.P.– Ideal cycles- Refrigerants Desirable properties – Classification - Nomenclature - ODP & GWP.

UNIT II VAPOUR COMPRESSION REFRIGERATION SYSTEM

UNIT III OTHER REFRIGERATION SYSTEMS
Working principles of Vapour absorption systems and adsorption cooling systems – Steam jet refrigeration- Ejector refrigeration systems- Thermoelectric refrigeration- Air refrigeration - Magnetic - Vortex and Pulse tube refrigeration systems.
UNIT IV  PSYCHROMETRIC PROPERTIES AND PROCESSES  10
Properties of moist Air-Gibbs Dalton law, Specific humidity, Dew point temperature, Degree of saturation, Relative humidity, Enthalpy, Humid specific heat, Wet bulb temperature Thermodynamic wet bulb temperature, Psychrometric chart; Psychrometric of air-conditioning processes, mixing of air streams.

UNIT V  AIR CONDITIONING SYSTEMS AND LOAD ESTIMATION  12
Air conditioning loads: Outside and inside design conditions; Heat transfer through structure, Solar radiation, Electrical appliances, Infiltration and ventilation, internal heat load; Apparatus selection; fresh air load, human comfort & IAQ principles, effective temperature & chart, calculation of summer & winter air conditioning load; Classifications, Layout of plants; Air distribution system; Filters; Air Conditioning Systems with Controls: Temperature, Pressure and Humidity sensors, Actuators & Safety controls.

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to demonstrate the operations in different Refrigeration & Air conditioning systems and also able to design Refrigeration & Air conditioning systems.

TEXT BOOK:

REFERENCES:

ME6003  RENEWABLE SOURCES OF ENERGY  L T P C  3 0 0 3

OBJECTIVES:
• At the end of the course, the students are expected to identify the new methodologies / technologies for effective utilization of renewable energy sources.

UNIT I  INTRODUCTION  9

UNIT II  SOLAR ENERGY  9

UNIT III  WIND ENERGY  9
UNIT IV  BIO - ENERGY
Biomass direct combustion – Biomass gasifiers – Biogas plants – Digesters – Ethanol production –
Bio diesel – Cogeneration - Biomass Applications

UNIT V  OTHER RENEWABLE ENERGY SOURCES
Tidal energy – Wave Energy – Open and Closed OTEC Cycles – Small Hydro-Geothermal Energy –

OUTCOMES:
• Upon completion of this course, the students can able to identify the new methodologies /
technologies for effective utilization of renewable energy sources.

TEXT BOOKS:

REFERENCES:
2. Godfrey Boyle, "Renewable Energy, Power for a Sustainable Future", Oxford University Press,
U.K., 1996.
6. David M. Mousdale – "Introduction to Biofuels", CRC Press, Taylor & Francis Group, USA
2010

ME6004  UNCONVENTIONAL MACHINING PROCESSES

OBJECTIVES:
• To learn about various unconventional machining processes, the various process parameters
and their influence on performance and their applications

UNIT I  INTRODUCTION

UNIT II  MECHANICAL ENERGY BASED PROCESSES
Abrasive Jet Machining – Water Jet Machining – Abrasive Water Jet Machining - Ultrasonic
Machining.(AJM, WJM, AWJM and USM). Working Principles – equipment used – Process
parameters – MRR- Applications.

UNIT III  ELECTRICAL ENERGY BASED PROCESSES
Electric Discharge Machining (EDM)- working Principle-equipments-Process Parameters-Surface
Finish and MRR- electrode / Tool – Power and control Circuits-Tool Wear – Dielectric – Flushing –
Wire cut EDM – Applications.
UNIT IV CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES

UNIT V THERMAL ENERGY BASED PROCESSES
Laser Beam machining and drilling (LBM), plasma Arc machining (PAM) and Electron Beam Machining (EBM). Principles – Equipment –Types - Beam control techniques – Applications.

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to demonstrate different unconventional machining processes and know the influence of different process parameters on the performance and their applications.

TEXT BOOKS:

REFERENCES:

ME6005 PROCESS PLANNING AND COST ESTIMATION

OBJECTIVES:
• To introduce the process planning concepts to make cost estimation for various products after process planning

UNIT I INTRODUCTION TO PROCESS PLANNING
Introduction- methods of process planning-Drawing interpretation-Material evaluation – steps in process selection-.Production equipment and tooling selection

UNIT II PROCESS PLANNING ACTIVITIES
Process parameters calculation for various production processes-Selection jigs and fixtures election of quality assurance methods - Set of documents for process planning-Economics of process planning- case studies

UNIT III INTRODUCTION TO COST ESTIMATION
Importance of costing and estimation –methods of costing-elements of cost estimation –Types of estimates – Estimating procedure- Estimation labor cost, material cost- allocation of over head charges- Calculation of depreciation cost
UNIT IV    PRODUCTION COST ESTIMATION
Estimation of Different Types of Jobs - Estimation of Forging Shop, Estimation of Welding Shop, Estimation of Foundry Shop

UNIT V    MACHINING TIME CALCULATION
Estimation of Machining Time - Importance of Machine Time Calculation- Calculation of Machining Time for Different Lathe Operations ,Drilling and Boring - Machining Time Calculation for Milling, Shaping and Planning -Machining Time Calculation for Grinding

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to use the concepts of process planning and cost estimation for various products.

TEXT BOOKS:

REFERENCES:

ME6006    DESIGN OF JIGS, FIXTURES AND PRESS TOOLS

OBJECTIVES:
• To understand the functions and design principles of Jigs, fixtures and press tools
• To gain proficiency in the development of required views of the final design.

UNIT I    LOCATING AND CLAMPING PRINCIPLES:

UNIT II    JIGS AND FIXTURES
Design and development of jigs and fixtures for given component- Types of Jigs – Post, Turnover, Channel, latch, box, pot, angular post jigs – Indexing jigs – General principles of milling, Lathe, boring, broaching and grinding fixtures – Assembly, Inspection and Welding fixtures – Modular fixturing systems- Quick change fixtures.

UNIT III    PRESS WORKING TERMINOLOGIES AND ELEMENTS OF CUTTING DIES
UNIT IV  BENDING AND DRAWING DIES


UNIT V  OTHER FORMING TECHNIQUES

Bulging, Swaging, Embossing, coining, curling, hole flanging, shaving and sizing, assembly, fine Blanking dies – recent trends in tool design- computer Aids for sheet metal forming Analysis – basic introduction - tooling for numerically controlled machines- setup reduction for work holding – Single minute exchange of dies – Poka Yoke.

TOTAL: 45 PERIODS

Note: (Use of P S G Design Data Book is permitted in the University examination)

OUTCOMES:
• Upon completion of this course, the students can able to design jigs, fixtures and press tools.

TEXT BOOKS:

REFERENCES:
5. ASTME Fundamentals of Tool Design Prentice Hall of India.

ME6007  COMPOSITE MATERIALS AND MECHANICS

OBJECTIVES:
• To understand the fundamentals of composite material strength and its mechanical behavior
• Understanding the analysis of fiber reinforced Laminate design for different combinations of plies with different orientations of the fiber.
• Thermo-mechanical behavior and study of residual stresses in Laminates during processing.
• Implementation of Classical Laminate Theory (CLT) to study and analysis for residual stresses in an isotropic layered structure such as electronic chips.

UNIT I  INTRODUCTION, LAMINA CONSTITUTIVE EQUATIONS & MANUFACTURING


UNIT II FLAT PLATE LAMINATE CONSTITUTE EQUATIONS

UNIT III LAMINA STRENGTH ANALYSIS

UNIT IV THERMAL ANALYSIS

UNIT V ANALYSIS OF LAMINATED FLAT PLATES

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to analyse the fiber reinforced Laminate for optimum design
- Apply classical laminate theory to study and analyse the residual stresses in Laminate.

TEXT BOOKS:

REFERENCES:
OBJECTIVES

- To understand the basics of welding and to know about the various types of welding processes

UNIT I GAS AND ARC WELDING PROCESSES: 9
Fundamental principles – Air Acetylene welding, Oxyacetylene welding, Carbon arc welding, Shielded metal arc welding, Submerged arc welding, TIG & MIG welding, Plasma arc welding and Electroslag welding processes - advantages, limitations and applications.

UNIT II RESISTANCE WELDING PROCESSES: 9
Spot welding, Seam welding, Projection welding, Resistance Butt welding, Flash Butt welding, Percussion welding and High frequency resistance welding processes - advantages, limitations and applications.

UNIT III SOLID STATE WELDING PROCESSES: 9
Cold welding, Diffusion bonding, Explosive welding, Ultrasonic welding, Friction welding, Forge welding, Roll welding and Hot pressure welding processes - advantages, limitations and applications.

UNIT IV OTHER WELDING PROCESSES: 9

UNIT V DESIGN OF WELD JOINTS, WELDABILITY AND TESTING OF WELDMENTS 9
Various weld joint designs – Weldability of Aluminium, Copper, and Stainless steels. Destructive and non destructive testing of weldments.

OUTCOMES:
- Upon completion of this course, the students can able to compare different types of Welding process for effective Welding of Structural components.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
At the end of the course, the student is expected to
- understand and analyse the energy data of industries
- carryout energy accounting and balancing
- conduct energy audit and suggest methodologies for energy savings and
- utilise the available resources in optimal ways

UNIT I - INTRODUCTION

UNIT II - ELECTRICAL SYSTEMS

UNIT III - THERMAL SYSTEMS

UNIT IV - ENERGY CONSERVATION IN MAJOR UTILITIES
Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems – Cooling Towers – D.G. sets

UNIT V - ECONOMICS
Energy Economics – Discount Rate, Payback Period, Internal Rate of Return, Net Present Value, Life Cycle Costing –ESCO concept

OUTCOMES:
Upon completion of this course, the students can able to analyse the energy data of industries.
- Can carryout energy accounting and balancing
- Can suggest methodologies for energy savings

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To understand the functions of the basic components of a Robot.
- To study the use of various types of End of Effectors and Sensors.
- To impart knowledge in Robot Kinematics and Programming.
- To learn Robot safety issues and economics.

UNIT I  FUNDAMENTALS OF ROBOT  6
Robot - Definition - Robot Anatomy - Co ordinate Systems, Work Envelope Types and Classification Specifications-Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load- Robot Parts and their Functions-Need for Robots-Different Applications.

UNIT II  ROBOT DRIVE SYSTEMS AND END EFFECTORS  9
Pneumatic Drives-Hydraulic Drives-Mechanical Drives-Electrical Drives-D.C. Servo Motors, Stepper Motors, A.C. Servo Motors-Salient Features, Applications and Comparison of all these Drives, End Effectors-Grippers-Mechanical Grippers, Pneumatic and Hydraulic- Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations.

UNIT III  SENSORS AND MACHINE VISION  12

UNIT IV  ROBOT KINEMATICS AND ROBOT PROGRAMMING  13
Forward Kinematics, Inverse Kinematics and Difference; Forward Kinematics and Reverse Kinematics of manipulators with Two, Three Degrees of Freedom (in 2 Dimension), Four Degrees of freedom (in 3 Dimension) Jacobians, Velocity and Forces-Manipulator Dynamics, Trajectory Generator, Manipulator Mechanism Design-Derivations and problems. Lead through Programming, Robot programming Languages-VAL Programming-Motion Commands, Sensor Commands, End Effector commands and simple Programs.

UNIT V  IMPLEMENTATION AND ROBOT ECONOMICS  5
RGV, AGV; Implementation of Robots in Industries-Various Steps; Safety Considerations for Robot Operations - Economic Analysis of Robots.

OUTCOMES:
- Upon completion of this course, the students can able to apply the basic engineering knowledge for the design of robotics.

TEXT BOOKS:
REFERENCES:

GE6081 FUNDAMENTALS OF NANOSCIENCE

OBJECTIVES
- To learn about basis of nanomaterial science, preparation method, types and application

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

UNIT II GENERAL METHODS OF PREPARATION
Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III NANOMATERIALS
Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications- Nanometal oxides-ZnO, TiO2,MgO, ZrO2, NiO, nanoalumina, CaO, AgTiO2, Ferrites, Nanoclays-functionailization and applications-Quantum wires, Quantum dots-preparation, properties and applications

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

UNIT V APPLICATIONS

TOTAL : 45 PERIODS
OUTCOMES

- Will familiarize about the science of nanomaterials
- Will demonstrate the preparation of nanomaterials
- Will develop knowledge in characteristic nanomaterial

TEXT BOOKS


REFERENCES


ME6011 THERMAL TURBO MACHINES

OBJECTIVES:

- To understand the various systems, principles, operations and applications of different types of turbo machinery components.

UNIT I PRINCIPLES

Energy transfer between fluid and rotor-classification of fluid machinery,-dimensionless parameters-specific speed-applications-stage velocity triangles-work and efficiency.

UNIT II CENTRIFUGAL FANS AND BLOWERS

Types- stage and design parameters-flow analysis in impeller blades-volute and diffusers, losses, characteristic curves and selection, fan drives and fan noise.

UNIT III CENTRIFUGAL COMPRESSOR

Construction details, impeller flow losses, slip factor, diffuser analysis, losses and performance curves.

UNIT IV AXIAL FLOW COMPRESSOR

Stage velocity diagrams, enthalpy-entropy diagrams, stage losses and efficiency, work done simple stage design problems and performance characteristics.

UNIT V AXIAL AND RADIAL FLOW TURBINES

Stage velocity diagrams, reaction stages, losses and coefficients, blade design principles, testing and performance characteristics.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to explain the various systems, principles and applications and different types of turbo machinery components.
TEXT BOOKS:

REFERENCES:

ME6012 MAINTENANCE ENGINEERING L T P C
3 0 0 3

OBJECTIVES:
- To enable the student to understand the principles, functions and practices adapted in industry for the successful management of maintenance activities.
- To explain the different maintenance categories like Preventive maintenance, condition monitoring and repair of machine elements.
- To illustrate some of the simple instruments used for condition monitoring in industry.

UNIT I PRINCIPLES AND PRACTICES OF MAINTENANCE PLANNING 9

UNIT II MAINTENANCE POLICIES – PREVENTIVE MAINTENANCE 9
Maintenance categories – Comparative merits of each category – Preventive maintenance, maintenance schedules, repair cycle - Principles and methods of lubrication – TPM.

UNIT III CONDITION MONITORING 9
Condition Monitoring – Cost comparison with and without CM – On-load testing and offload testing – Methods and instruments for CM – Temperature sensitive tapes – Pistol thermometers – wear-debris analysis

UNIT IV REPAIR METHODS FOR BASIC MACHINE ELEMENTS 10
Repair methods for beds, slide ways, spindles, gears, lead screws and bearings – Failure analysis – Failures and their development – Logical fault location methods – Sequential fault location.

UNIT V REPAIR METHODS FOR MATERIAL HANDLING EQUIPMENT 8
Repair methods for Material handling equipment - Equipment records -Job order systems -Use of computers in maintenance.

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of the programme, the students can able to implement the maintenance function and different practices in industries for the successful management of maintenance activities.
• To identify the different maintenance categories like Preventive maintenance, condition monitoring and repair of machine elements.

TEXT BOOKS:

REFERENCES:

EE6007 MICRO ELECTRO MECHANICAL SYSTEMS L T P C 3 0 0 3

OBJECTIVES
• To provide knowledge of semiconductors and solid mechanics to fabricate MEMS devices.
• To educate on the rudiments of Micro fabrication techniques.
• To introduce various sensors and actuators
• To introduce different materials used for MEMS
• To educate on the applications of MEMS to disciplines beyond Electrical and Mechanical engineering.

UNIT I INTRODUCTION 9

UNIT II SENSORS AND ACTUATORS-I 9

UNIT III SENSORS AND ACTUATORS-II 9
UNIT IV  MICROMACHINING
Silicon Anisotropic Etching – Anisotrophic Wet Etching – Dry Etching of Silicon – Plasma Etching –
Deep Reaction Ion Etching (DRIE) – Isotropic Wet Etching – Gas Phase Etchants – Case studies -
Basic surface micro machining processes – Structural and Sacrificial Materials – Acceleration of
sacrificial Etch – Striction and Antistriction methods – LIGA Process - Assembly of 3D MEMS –
Foundry process.

UNIT V  POLYMER AND OPTICAL MEMS
Polymers in MEMS– Polimide - SU-8 - Liquid Crystal Polymer (LCP) – PDMS – PMMA – Parylene –
Fluorocarbon - Application to Acceleration, Pressure, Flow and Tactile sensors- Optical MEMS –
Lenses and Mirrors – Actuators for Active Optical MEMS.

TOTAL : 45 PERIODS

OUTCOMES
• Ability to understand and apply basic science, circuit theory, Electro-magnetic field theory
  control theory and apply them to electrical engineering problems.
• Ability to understand and analyse, linear and digital electronic circuits.

TEXT BOOKS:

REFERENCES:
  Smart Devices”, John Wiley & Son LTD,2002
  Springer 2012.

IE6605  PRODUCTION PLANNING AND CONTROL

OBJECTIVES:
• To understand the various components and functions of production planning and control such as
  work study, product planning, process planning, production scheduling, Inventory Control.
• To know the recent trends like manufacturing requirement Planning (MRP II) and Enterprise
  Resource Planning (ERP).

UNIT I  INTRODUCTION
Objectives and benefits of planning and control-Functions of production control-Types of production-
job- batch and continuous-Product development and design and development - Functional aspects-
Operational aspect-Durability and dependability aspect aesthetic aspect. Profit consideration-
Standardization, Simplification & specialization- Break even analysis-Economics of a new design.
UNIT II  WORK STUDY
Method study, basic procedure-Selection-Recording of process - Critical analysis, Development - Implementation - Micro motion and memo motion study – work measurement - Techniques of work measurement - Time study - Production study - Work sampling - Synthesis from standard data - Predetermined motion time standards.

UNIT III  PRODUCT PLANNING AND PROCESS PLANNING
Product planning-Extending the original product information-Value analysis-Problems in lack of product planning-Process planning and routing-Pre requisite information needed for process planning-Steps in process planning-Quantity determination in batch production-Machine capacity, balancing-Analysis of process capabilities in a multi product system.

UNIT IV  PRODUCTION SCHEDULING

UNIT V  INVENTORY CONTROL AND RECENT TRENDS IN PPC
Inventory control-Purpose of holding stock-Effect of demand on inventories-Ordering procedures. Two bin system -Ordering cycle system-Determination of Economic order quantity and economic lot size-ABC analysis-Recorder procedure-Introduction to computer integrated production planning systems-elements of JUST IN TIME SYSTEMS-Fundamentals of MRP II and ERP.

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to prepare production planning and control activities such as work study, product planning, production scheduling, Inventory Control.
- They can plan manufacturing requirements manufacturing requirement Planning (MRP II) and Enterprise Resource Planning (ERP).

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To develop and strengthen entrepreneurial quality and motivation in students and to impart basic entrepreneurial skills and understanding to run a business efficiently and effectively.

UNIT I ENTREPRENEURSHIP


UNIT II MOTIVATION

Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.

UNIT III BUSINESS


UNIT IV FINANCING AND ACCOUNTING


UNIT V SUPPORT TO ENTREPRENEURS


TOTAL : 45 PERIODS

OUTCOMES :

- Upon completion of the course, students will be able to gain knowledge and skills needed to run a business successfully.

TEXT BOOKS :


REFERENCES :

OBJECTIVES:

- To understand the Mathematical knowledge to design pressure vessels and piping
- To understand the ability to carry of stress analysis in pressure vessels and piping

UNIT I  INTRODUCTION

UNIT II  STRESSES IN PRESSURE VESSELS

UNIT III  DESIGN OF VESSELS
Design of Tall cylindrical self supporting process columns – Supports for short vertical vessels – Stress concentration at a variable Thickness transition section in a cylindrical vessel, about a circular hole, elliptical openings. Theory of Reinforcement – Pressure Vessel Design.

UNIT IV  BUCKLING AND FRACTURE ANALYSIS IN VESSELS
Buckling phenomenon – Elastic Buckling of circular ring and cylinders under external pressure – collapse of thick walled cylinders or tubes under external pressure – Effect of supports on Elastic Buckling of Cylinders – Buckling under combined External pressure and axial loading.

UNIT V  PIPING

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to apply the mathematical fundamental for the design of pressure vessels and pipes. Further they can able to analyse and design of pressure vessels and piping.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To introduce Governing Equations of viscous fluid flows
- To introduce numerical modeling and its role in the field of fluid flow and heat transfer
- To enable the students to understand the various discretization methods, solution procedures and turbulence modeling.
- To create confidence to solve complex problems in the field of fluid flow and heat transfer by using high speed computers.

UNIT I  GOVERNING EQUATIONS AND BOUNDARY CONDITIONS  8

UNIT II  FINITE DIFFERENCE AND FINITE VOLUME METHODS FOR DIFFUSION  9

UNIT III  FINITE VOLUME METHOD FOR CONVECTION DIFFUSION  10
Steady one-dimensional convection and diffusion – Central, upwind differencing schemes properties of discretization schemes – Conservativeness, Boundedness, Transportiveness, Hybrid, Power-law, QUICK Schemes.

UNIT IV  FLOW FIELD ANALYSIS  9

UNIT V  TURBULENCE MODELS AND MESH GENERATION  9

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students can able
- To create numerical modeling and its role in the field of fluid flow and heat transfer
- To use the various discretization methods, solution procedures and turbulence modeling to solve flow and heat transfer problems.

TEXT BOOKS:

REFERENCES:

ME6015  OPERATIONS RESEARCH

L T P C
3 0 0 3

OBJECTIVES:
- To provide knowledge and training in using optimization techniques under limited resources for the engineering and business problems.

UNIT I  LINEAR MODELS

UNIT II  TRANSPORTATION MODELS AND NETWORK MODELS

UNIT III  INVENTORY MODELS
Inventory models – Economic order quantity models – Quantity discount models – Stochastic inventory models – Multi product models – Inventory control models in practice.

UNIT IV  QUEUEING MODELS
Queueing models - Queueing systems and structures – Notation parameter – Single server and multi server models – Poisson input – Exponential service – Constant rate service – Infinite population – Simulation.

UNIT V  DECISION MODELS

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to use the optimization techniques for use engineering and Business problems.

TEXT BOOK:

REFERENCES:
ME6016 ADVANCED I.C ENGINES

OBJECTIVES:
• To understand the underlying principles of operation of different IC Engines and components.
• To provide knowledge on pollutant formation, control, alternate fuel etc.

UNIT I SPARK IGNITION ENGINES

UNIT II COMPRESSION IGNITION ENGINES

UNIT III POLLUTANT FORMATION AND CONTROL

UNIT IV ALTERNATIVE FUELS
Alcohol, Hydrogen, Compressed Natural Gas, Liquefied Petroleum Gas and Bio Diesel - Properties, Suitability, Merits and Demerits - Engine Modifications.

UNIT V RECENT TRENDS

TOTAL : 45 PERIODS

OUTCOME:
• Upon completion of this course, the students can able to compare the operations of different IC Engine and components and can evaluate the pollutant formation, control, alternate fuel

TEXT BOOKS:
REFERENCES:

ME6017 DESIGN OF HEAT EXCHANGERS L T P C
3 0 0 3

OBJECTIVES:
• To learn the thermal and stress analysis on various parts of the heat exchangers
• To analyze the sizing and rating of the heat exchangers for various applications

UNIT I INTRODUCTION 9
Types of heat exchangers, shell and tube heat exchangers – regenerators and recuperators - Temperature distribution and its implications - Parts description, Classification as per Tubular Exchanger Manufacturers Association (TEMA)

UNIT II PROCESS DESIGN OF HEAT EXCHANGERS 9

UNIT III STRESS ANALYSIS 9
Stress in tubes – header sheets and pressure vessels – thermal stresses, shear stresses - types of failures, buckling of tubes, flow induced vibration.

UNIT IV COMPACT AND PLATE HEAT EXCHANGER 9
Types- Merits and Demerits- Design of compact heat exchangers, plate heat exchangers, performance influencing parameters, limitations.

UNIT V CONDENSERS AND COOLING TOWERS 9
Design of surface and evaporative condensers – cooling tower – performance characteristics.

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to apply the mathematical knowledge for thermal and stress analysis on various parts of the heat exchangers components.

TEXT BOOKS:

REFERENCES:

ME6018 ADDITIVE MANUFACTURING

OBJECTIVES:
- To know the principle methods, areas of usage, possibilities and limitations as well as environmental effects of the Additive Manufacturing technologies
- To be familiar with the characteristics of the different materials those are used in Additive Manufacturing.

UNIT I INTRODUCTION

UNIT II CAD & REVERSE ENGINEERING

UNIT III LIQUID BASED AND SOLID BASED ADDITIVE MANUFACTURING SYSTEMS
Classification – Liquid based system – Stereolithography Apparatus (SLA)- Principle, process, advantages and applications - Solid based system –Fused Deposition Modeling - Principle, process, advantages and applications, Laminated Object Manufacturing

UNIT IV POWDER BASED ADDITIVE MANUFACTURING SYSTEMS

UNIT V MEDICAL AND BIO-ADDITIVE MANUFACTURING
Customized implants and prosthesis: Design and production. Bio-Additive Manufacturing- Computer Aided Tissue Engineering (CATE) – Case studies

TOTAL : 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to compare different method and discuss the effects of the Additive Manufacturing technologies and analyse the characteristics of the different materials in Additive Manufacturing.

TEXT BOOKS:

REFERENCES:
ME6019 NON DESTRUCTIVE TESTING AND MATERIALS

OBJECTIVES:

- To study and understand the various Non Destructive Evaluation and Testing methods, theory and their industrial applications.

UNIT I OVERVIEW OF NDT

NDT Versus Mechanical testing, Overview of the Non Destructive Testing Methods for the detection of manufacturing defects as well as material characterisation. Relative merits and limitations, Various physical characteristics of materials and their applications in NDT., Visual inspection – Unaided and aided.

UNIT II SURFACE NDE METHODS


UNIT III THERMOGRAPHY AND EDDY CURRENT TESTING (ET)


UNIT IV ULTRASONIC TESTING (UT) AND ACOUSTIC EMISSION (AE)


UNIT V RADIOGRAPHY (RT)

Principle, interaction of X-Ray with matter, imaging, film and film less techniques, types and use of filters and screens, geometric factors, Inverse square, law, characteristics of films - graininess, density, speed, contrast, characteristic curves, Penetrameters, Exposure charts, Radiographic equivalence. Fluoroscopy- Xero-Radiography, Computed Radiography, Computed Tomography

OUTCOMES:

- Upon completion of this course, the students can able to use the various Non Destructive Testing and Testing methods understand for defects and characterization of industrial components

TEXT BOOKS:


REFERENCES:

ME6020 VIBRATION AND NOISE CONTROL L T P C 3 0 0 3

OBJECTIVES:
• The student will be able to understand the sources of vibration and noise in automobiles and make design modifications to reduce the vibration and noise and improve the life of the components

UNIT I BASICS OF VIBRATION 9
Introduction, classification of vibration: free and forced vibration, undamped and damped vibration, linear and non linear vibration, response of damped and undamped systems under harmonic force, analysis of single degree and two degree of freedom systems, torsional vibration, determination of natural frequencies.

UNIT II BASICS OF NOISE 9
Introduction, amplitude, frequency, wavelength and sound pressure level, addition, subtraction and averaging decibel levels, noise dose level, legislation, measurement and analysis of noise, measurement environment, equipment, frequency analysis, tracking analysis, sound quality analysis.

UNIT III AUTOMOTIVE NOISE SOURCES 9

UNIT IV CONTROL TECHNIQUES 9
Vibration isolation, tuned absorbers, un-tuned viscous dampers, damping treatments, application dynamic forces generated by IC engines, engine isolation, crank shaft damping, modal analysis of the mass elastic model shock absorbers.

UNIT V SOURCE OF NOISE AND CONTROL 9
Methods for control of engine noise, combustion noise, mechanical noise, predictive analysis, palliative treatments and enclosures, automotive noise control principles, sound in enclosures, sound energy absorption, sound transmission through barriers

TOTAL: 45 PERIODS
OUTCOMES:
• Understanding causes, source and types of vibrations in machineries
• Gaining knowledge in sources and measurement standard of noise
• Ability to design and develop vibrations and noise control systems.

TEXT BOOKS:

REFERENCES:
# ANNA UNIVERSITY, CHENNAI
## AFFILIATED INSTITUTIONS
### B.E. PRODUCTION ENGINEERING
#### I – VIII SEMESTERS CURRICULUM AND SYLLABUS

## SEMESTER I

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## SEMESTER VII

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<th>SL.NO.</th>
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## SEMESTER VIII

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**TOTAL NUMBER OF CREDITS TO BE EARNED FOR AWARD OF THE DEGREE = 195**

### ELECTIVES FOR B.E. PRODUCTION ENGINEERING

#### SEMESTER VI (Elective I)

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<th>SL. NO.</th>
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#### SEMESTER VI (Elective II)

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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 - Reading 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
- Project
- Assignment
- Reviews
- Creative writing
- Poster making, etc.

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%**

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MA6151 MATHEMATICS – I

L T P C
3 1 0 4

**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

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.

TEXT BOOKS:

REFERENCES:

PH6151  ENGINEERING PHYSICS – I  L T P C
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

Elasticity - Hooke’s law - Relationship between three moduli 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


UNIT III QUANTUM PHYSICS


UNIT IV ACOUSTICS AND ULTRASONICS


Production of ultrasonics 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.

TEXT BOOKS:
1. Arumugam M. Engineering Physics. Anuradha publishers, 2010

REFERENCES:
1. Searls and Zemansky. University Physics, 2009
5. Rajagopal K. Engineering Physics. PHI, New Delhi, 2011
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 polydispersity 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 isochore (problems).

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY

UNIT IV PHASE RULE AND ALLOYS

UNIT V NANOCHEMISTRY
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

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.
TEXT BOOKS:

REFERENCES:

GE6151          COMPUTER PROGRAMMING
L    T    P    C
3    0    0    3

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:

GE6152    ENGINEERING GRAPHICS  L T P C
          2 0 3 4

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  5+9
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  5+9
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.

**TOTAL: 75 PERIODS**

**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.

**TEXT BOOK:**


**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:
1. Search, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions – Includes Parameter Passing
9. Program using Recursive Function and conversion from given program to flow chart.
10. 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.
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  9

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  13

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

**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

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.

TOTAL: 30 PERIODS

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 - 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 - 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
9+3
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.

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

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%

MA6251 MATHEMATICS – II
L T P C
3 1 0 4

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
9+3
Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green’s theorem in a plane, Gauss divergence theorem and Stokes’ theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.
UNIT II ORINARY 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 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: \( w = z+k, kx, 1/z, z^2, e^z \) 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).

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.

TEXT BOOKS:

REFERENCES:
PH6251  
ENGINEERING PHYSICS – II  

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

**UNIT I  
CONDUCTING MATERIALS**
9

**UNIT II  
SEMICONDUCTING MATERIALS**
9

**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
Metallic glasses: preparation, properties and applications. Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, Nanomaterials- Preparation -pulsed laser deposition – chemical vapour deposition – Applications – NLO materials –Birefringence- optical Kerr effect – Classification of Biomaterials and its applications

**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.

**TEXT BOOKS:**

**REFERENCES:**
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

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


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.

TEXT BOOKS:

REFERENCES:

GE6252 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING L T P C
4 0 0 4

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

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:**

GE6253  
**ENGINEERING MECHANICS**  
L T P C  
3 1 0 4

**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
Free body diagram – Types of supports –Action and reaction forces –stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon’s theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

**UNIT III  
PROPERTIES OF SURFACES AND SOLIDS**  
12
Centroids and centre of mass– Centroids of lines and areas - Rectangular, circular, triangular areas by integration – T section, I section, - Angle section, Hollow section by using standard formula – Theorems of Pappus - Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem –Principal moments of inertia of plane areas –
Principal axes of inertia-Mass moment of inertia – mass moment of inertia for prismatic, cylindrical and spherical solids from first principle – Relation to area moments of inertia.

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.

TEXT BOOKS:

REFERENCES:

GE6261 COMPUTER AIDED DRAFTING AND MODELING LABORATORY

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
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>
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<tr>
<th>Sl.No</th>
<th>Description of Equipment</th>
<th>Quantity</th>
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<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>
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GE6262 PHYSICS AND CHEMISTRY LABORATORY – II

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)
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  9 + 3

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

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


PR6301 BASIC MACHINING PROCESSES L T P C
3  0  0  3

OBJECTIVES:
• To impart the knowledge on basic concepts of various machining processes and machine tools.

UNIT I LATHE

UNIT II SHAPER, PLANER AND SLOTTER

UNIT III DRILLING

UNIT IV MILLING
UNIT V  GRINDING  9

OUTCOMES:
• Upon completion of this subject, the students can able to identify different manufacturing techniques for the Industrial component production.

TEXT BOOKS

REFERENCES

PR6302  BASICS OF THERMODYNAMICS AND THERMAL ENGINEERING  L T P C
3 1 0 4

OBJECTIVES
• To introduce fundamental concepts in thermodynamics, heat transfer, propulsion and refrigeration and air conditioning.

UNIT I  BASIC THERMODYNAMICS  16

UNIT II  AIR CYCLE AND COMPRESSORS  12
Otto, Diesel, Dual combustion and Brayton cycles. Air standard efficiency . Mean effective pressure, Reciprocating compressors.

UNIT III  STEAM AND JET PROPULSION  12

UNIT IV  REFRIGERATION AND AIR-CONDITIONING  10
Principles of Psychrometry and refrigeration - Vapour compression - Vapour absorption types - Co-efficient of performance, Properties of refrigerants – Basic Principle and types Air conditioning.
UNIT V  HEAT TRANSFER  10

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

(Use of standard thermodynamic tables, Mollier diagram and Refrigerant property tables are permitted)

OUTCOMES:
- Upon completion of this subject, the students can able to apply basic thermodynamics principles to different thermal engines jet propulsion system and refrigeration and air conditioning systems.

TEXT BOOKS

REFERENCES

PR6303  ENGINEERING METALLURGY  L T P C
3 0 0 3

OBJECTIVES:
- To introduce the various concepts of metallurgy, metallurgical structures and mechanical properties, testing of metals
- To impart the knowledge on metallurgy with respect to foundry and welding Processes

UNIT I  CONSTITUTION OF ALLOYS AND PHASE DIAGRAMS  10

UNIT II  HEAT TREATMENT  10
UNIT III  FERROUS, NON FERROUS METALS


UNIT IV  MECHANICAL PROPERTIES AND TESTING


UNIT V  WELDING AND FOUNDRY METALLURGY


TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of this subject, the students can able to identify suitable heat treatment different materials in mechanical industries and also perform testing to know the mechanical properties of the materials.

TEXT BOOKS

REFERENCES

CE6451  FLUID MECHANICS AND MACHINERY  L T P C
3 0 0 3

OBJECTIVES:
• The applications of the conservation laws to flow through pipes and hydraulic machines are studied
• To understand the importance of dimensional analysis.
• To understand the importance of various types of flow in pumps and turbines.

UNIT I  FLUID PROPERTIES AND FLOW CHARACTERISTICS

Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, surface tension and capillarity. Flow characteristics – concept of control volume - application of continuity equation, energy equation and momentum equation.
UNIT II  FLOW THROUGH CIRCULAR CONDUTS  8

UNIT III DIMENSIONAL ANALYSIS  9
Need for dimensional analysis – methods of dimensional analysis – Similitude –types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis.

UNIT IV PUMPS  10

UNIT V TURBINES  10

OUTCOMES:
• Upon completion of this course, the students can able to apply mathematical knowledge to predict the properties and characteristics of a fluid.
• Can critically analyse the performance of pumps and turbines.

TEXT BOOK:

REFERENCES:

EE6351 ELECTRICAL DRIVES AND CONTROLS L T P C 3 0 0 3

OBJECTIVES
• To understand the basic concepts of different types of electrical machines and their performance.
• To study the different methods of starting D.C motors and induction motors.
• To study the conventional and solid-state drives

UNIT I INTRODUCTION  8
Basic Elements – Types of Electric Drives – factors influencing the choice of electrical drives – heating and cooling curves – Loading conditions and classes of duty – Selection of power rating for drive motors with regard to thermal overloading and Load variation factors
UNIT II DRIVE MOTOR CHARACTERISTICS
Mechanical characteristics – Speed-Torque characteristics of various types of load and drive motors –
Braking of Electrical motors – DC motors: Shunt, series and compound - single phase and three
phase induction motors.

UNIT III STARTING METHODS
Types of D.C Motor starters – Typical control circuits for shunt and series motors – Three phase
squirrel cage and slip ring induction motors.

UNIT IV CONVENTIONAL AND SOLID STATE SPEED CONTROL
OF D.C. DRIVES
Speed control of DC series and shunt motors – Armature and field control, Ward-Leonard control
system - Using controlled rectifiers and DC choppers – applications.

UNIT V CONVENTIONAL AND SOLID STATE SPEED CONTROL
OF A.C. DRIVES
Speed control of three phase induction motor – Voltage control, voltage / frequency control, slip power
recovery scheme – Using inverters and AC voltage regulators – applications.

TOTAL : 45 PERIODS

OUTCOMES:
• Upon Completion of this subject, the students can able to explain different types of electrical
machines and their performance

TEXT BOOKS

REFERENCES

PR6311 BASIC MACHINING PROCESS LABORATORY

OBJECTIVES:
• To introduce different machining process and machine tool to develop components.

LIST OF EXPERIMENTS:
1. Lathe: Facing, Plain turning, Step Turning
2. Lathe: Taper Turning, Threading, Knurling
3. Lathe: Multi start Threading, Burnishing
4. Shaper: Cube
5. Shaper: Cube, V-Block
6. Drilling: Counter sinking, Counter Boring, Tapping
7. Milling Vertical: Surfacing, Pocket Milling
8. Milling Horizontal: Polygonal shape milling
9. Grinding: Surface & Cylindrical grinding
10. Slotting: Machining an internal spline

TOTAL: 45 PERIODS
OUTCOMES:
- Ability to use the machine tool and processes to shape and fabricate the components.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
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<tbody>
<tr>
<td>1</td>
<td>Lathe</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>Drilling Machine</td>
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<td>3</td>
<td>Shaper</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Vertical Milling Machine</td>
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</tr>
<tr>
<td>5</td>
<td>Horizontal Milling Machine</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Surface Grinding Machine</td>
<td>4</td>
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<tr>
<td>7</td>
<td>Cylindrical Grinding Machine</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Slotting Machine</td>
<td>2</td>
</tr>
</tbody>
</table>

LIST OF EXPERIMENTS
1. Determination of the Coefficient of discharge of given Orifice meter.
2. Determination of the Coefficient of discharge of given Venturi meter.
3. Calculation of the rate of flow using Rota meter.
4. Determination of friction factor for a given set of pipes.
5. Conducting experiments and drawing the characteristic curves of centrifugal pump/submergible pump
6. Conducting experiments and drawing the characteristic curves of reciprocating pump.
7. Conducting experiments and drawing the characteristic curves of Gear pump.
8. Conducting experiments and drawing the characteristic curves of Pelton wheel.
9. Conducting experiments and drawing the characteristics curves of Francis turbine.
10. Conducting experiments and drawing the characteristic curves of Kaplan turbine.

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to use the measurement equipments for flow measurement
- Ability to do performance trust on different fluid machinery

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<tr>
<th>S. No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Orifice meter setup</td>
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<tr>
<td>2</td>
<td>Venturi meter setup</td>
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<tr>
<td>3</td>
<td>Rotameter setup</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Pipe Flow analysis setup</td>
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</tr>
<tr>
<td>5</td>
<td>Centrifugal pump/submergible pump setup</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Reciprocating pump setup</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Gear pump setup</td>
<td>1</td>
</tr>
</tbody>
</table>
OBJECTIVES:
• To validate the principles studied in theory by performing experiments in the laboratory

LIST OF EXPERIMENTS
1. Load test on DC Shunt & DC Series motor
2. O.C.C & Load characteristics of DC Shunt and DC Series generator
3. Speed control of DC shunt motor (Armature, Field control)
4. Load test on single phase transformer
5. O.C & S.C Test on a single phase transformer
6. Regulation of an alternator by EMF & MMF methods.
7. V curves and inverted V curves of synchronous Motor
8. Load test on three phase squirrel cage Induction motor
9. Speed control of three phase slip ring Induction Motor
10. Load test on single phase Induction Motor.
11. Study of DC & AC Starters

OUTCOMES
• Ability to perform speed characteristic of different electrical machine

TOTAL: 45 PERIODS

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

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<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
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<tbody>
<tr>
<td>1</td>
<td>DC Shunt motor</td>
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<td>2</td>
<td>DC Series motor</td>
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<td>DC shunt motor-DC Shunt Generator set</td>
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<tr>
<td>4</td>
<td>DC Shunt motor-DC Series Generator set</td>
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<tr>
<td>5</td>
<td>Single phase transformer</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Three phase alternator</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Three phase synchronous motor</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Three phase Squirrel cage Induction motor</td>
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</tr>
<tr>
<td>9</td>
<td>Three phase Slip ring Induction motor</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Single phase Induction motor</td>
<td>1</td>
</tr>
</tbody>
</table>
MA6459 NUMERICAL METHODS

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

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

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

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

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.

TEXT BOOKS


REFERENCES


CE6306 STRENGTH OF MATERIALS

L T P C 3 1 0 4

OBJECTIVES:
To understand the stresses developed in bars, compounds bars, beams, shafts, cylinders and spheres.

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS

UNIT II TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM

UNIT III TORSION
Torsion formulation stresses and deformation in circular and hollows shafts – Stepped shafts – Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs.

UNIT IV DEFLECTION OF BEAMS
Double Integration method – Macaulay’s method – Area moment method for computation of slopes and deflections in beams - Conjugate beam and strain energy – Maxwell’s reciprocal theorems.

UNIT V THIN CYLINDERS, SPHERES AND THICK CYLINDERS
Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin and thick cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lame’s theorem.

OUTCOMES:
- Upon completion of this course, the students can able to apply mathematical knowledge to calculate the deformation behavior of simple structures.
- Critically analyse problem and solve the problems related to mechanical elements and analyse the deformation behavior for different types of loads.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To understand the theory of metal cutting
- To understand the concepts of gear manufacture
- To understand CNC machines constructional features, working and programming

UNIT I MECHANICS OF METAL CUTTING 10

UNIT II TOOL MATERIAL, TOOL WEAR AND TOOL LIFE 9

UNIT III GEAR MANUFACTURE 8

UNIT IV CNC MACHINES 9

UNIT V CNC PROGRAMMING 9

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to perform machining operations and study the forces tool life and wear can select proper tool materials for machining difficult materials and generate CNC processing to perform metal cutting operation.

TEXT BOOKS

REFERENCES
OBJECTIVES:

- To understand the basic concepts of mechanisms and machinery

UNIT I  MECHANISMS  14

UNIT II  FRICTION  12

UNIT III  GEARING AND CAMS  12

UNIT IV  BALANCING  11
Static and dynamic balancing – single and several masses in different planes – primary and secondary balancing of reciprocating masses – Balancing of single and multi cylinder engines – Governors and Gyroscopic effects.

UNIT V  VIBRATION  11

OUTCOMES:

- Upon completion of this course, the students can able to predict the force analysis in mechanical system and related vibration issues and can able to solve the problem

TEXT BOOKS

REFERENCES
PR6403 FLUID POWER DRIVES AND CONTROL

OBJECTIVES:
- To understand the working principle of hydraulic and pneumatic components and its selection
- To design hydraulic and pneumatic circuits for different applications

UNIT I INTRODUCTION TO FLUID POWER & HYDRAULICS PRINCIPLE 12

UNIT II FLUID POWER DRIVES 12
Fluid Power drives – Pumps – working principle and construction details of Gear, vane and piston pumps, Hydraulic motors, Hydrostatic transmission drives and characteristics, Hydraulic supply components Pneumatic power supply – compressors, air distribution, air motors.

UNIT III FLUID POWER ELEMENTS 12

UNIT IV HYDRAULIC AND PNEUMATIC CIRCUITS DESIGN 12

UNIT V ELECTRO PNEUMATICS AND PLC CIRCUITS 12
Use of electrical timers, switches, solenoid, relays, proximity sensors etc. electro pneumatic sequencing Ladder diagram – PLC – elements, functions and selection – PLC programming – Ladder and different programming methods - Sequencing circuits.

OUTCOME:
- Identify hydraulic and pneumatics components.
- Ability to design hydraulic and pneumatics circuits.

TEXT BOOKS:

REFERENCES:
OBJECTIVES

- To understand the basics of welding and to know about the various types of welding processes

UNIT I - GAS AND ARC WELDING PROCESSES: 9
Fundamental principles – Air Acetylene welding, Oxyacetylene welding, Carbon arc welding, Shielded metal arc welding, Submerged arc welding, TIG & MIG welding, Plasma arc welding and Electroslag welding processes - advantages, limitations and applications.

UNIT II - RESISTANCE WELDING PROCESSES: 9
Spot welding, Seam welding, Projection welding, Resistance Butt welding, Flash Butt welding, Percussion welding and High frequency resistance welding processes - advantages, limitations and applications.

UNIT III - SOLID STATE WELDING PROCESSES: 9
Cold welding, Diffusion bonding, Explosive welding, Ultrasonic welding, Friction welding, Forge welding, Roll welding and Hot pressure welding processes - advantages, limitations and applications.

UNIT IV - OTHER WELDING PROCESSES: 9

UNIT V - DESIGN OF WELD JOINTS, WELDABILITY AND TESTING OF WELDMENTS: 9
Various weld joint designs – Weldability of Aluminium, Copper, and Stainless steels. Destructive and non destructive testing of weldments.

OUTCOMES:
- Upon completion of this course, the students can able to compare different types of Welding process for effective Welding of Structural components.

TEXT BOOKS

REFERENCES
OBJECTIVES:
- To train the students in observation and interpretation of Microstructure of Engineering materials.
- To train students in Heat treatment, hardenability and surface treatment of Engineering Materials
- To train the students in testing of Foundry sand

LIST OF EXPERIMENTS:
1. Specimen preparation for macro – examination.
2. Specimen preparation for micro examination and study of Micro structure of –
   a) Carbon steel s(High, Medium, and Low)
   b) Cast Iron (Gray, White, Nodular, Malleable)
   c) Brass (70/30), Bronze (tin bronze), Al-Si alloy, cupro-nickel, Ti alloy.
4. Cooling curves
   a) Pure Metal (Pb or Sn)
   b) Alloy (Pb-Sn or Pb-Sb)
5. Heat treatments (carry out the following heat treatment and study the micro structure before and after heat treatments)
   a) Annealing
   b) Normalising
   c) Quench Hardening
   d) Tempering
6. Jominy End Quench Test
7. Foundry Sand testing
   a) Sieve analysis
   b) Strength of moulding sand
   c) Permeability of moulding sand
   d) Clay content of moulding sand
   e) Moisture content of moulding sand
8. Electro-chemical Test
   a) Electro deposition
   b) Electro-chemical etching test

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to incorporate to microstructure of different ferrous and non ferrous alloy
- Ability to perform heat treatment, surface treatment on metals.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
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<tbody>
<tr>
<td>1</td>
<td>Jominy End Quench Test</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Specimen Mounting Test with Digital Measurements</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Trinocular Microscopes with Objective Lens</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Disc Polishing Machine</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Muffle Furnace</td>
<td>1</td>
</tr>
</tbody>
</table>
OBJECTIVES
To supplement the theoretical knowledge gained in Mechanics of Solids with practical testing for determining the strength of materials under externally applied loads. This would enable the student to have a clear understanding of the design for strength and stiffness.

LIST OF EXPERIMENTS
1. Tension test on a mild steel rod
2. Double shear test on Mild steel and Aluminium rods
3. Torsion test on mild steel rod
4. Impact test on metal specimen
5. Hardness test on metals - Brinnell and Rockwell Hardness Number
6. Deflection test on beams
7. Compression test on helical springs
8. Strain Measurement using Rosette strain gauge
10. Tempering - Improvement Mechanical properties Comparison
   (i) Unhardened specimen
   (ii) Quenched Specimen and
   (iii) Quenched and tempered specimen.
11. Microscopic Examination of
   (i) Hardened samples and
   (ii) Hardened and tempered samples.

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to perform different destructive testing
- Ability to characteristic materials

LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Universal Tensile Testing machine with double 1 shear attachment – 40 Ton Capacity</td>
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</tr>
<tr>
<td>2</td>
<td>Torsion Testing Machine (60 NM Capacity)</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Impact Testing Machine (300 J Capacity)</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Brinell Hardness Testing Machine</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Rockwell Hardness Testing Machine</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Spring Testing Machine for tensile and compressive loads (2500 N)</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Metallurgical Microscopes</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Muffle Furnace (800 C)</td>
<td>1</td>
</tr>
</tbody>
</table>
OBJECTIVES

- To introduce the students the Indian standard code of practice for engineering drawing and general symbols and abbreviation used on the drawing.

LIST OF EXPERIMENTS

To provide hands on experience to develop 2D and 3D models of engineering components

1. Drawing of automobile components such as piston, connecting rod, valves, manifold and crank shaft.
2. Assembly drawing of screw jack, piston – connecting rod assembly, valve assembly, clutch assembly and gear box assembly.

OUTCOMES

- Ability to develop engineering drawing for the industrial component using Indian Standard code of practice.

TOTAL: 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
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<tr>
<td>1</td>
<td>Computer nodes</td>
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<td>Auto CAD</td>
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<td>3</td>
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</tbody>
</table>

OBJECTIVES

To the study of nature and the 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 10
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 10
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and 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 7

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

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

TEXT BOOKS:

REFERENCES:

PR6501 ENGINEERING METROLOGY AND MEASUREMENTS L T P C 3 0 0 3

OBJECTIVES
- To understand the basic principles of measurements
- To learn about various methods of measuring Mechanical parameters

UNIT I CONCEPT OF MEASUREMENT 10

UNIT II LINEAR AND ANGULAR MEASUREMENT 12

UNIT III FORM MEASUREMENT 12
Measurement of screw threads: Thread gauges, floating carriage micrometer measurement of gear tooth thickness: constant chord and base tangent method-Gleason gear testing machine – radius measurements-surface finish: equipment and parameters, straightness, flatness and roundness measurements.

UNIT IV LASER AND ADVANCES IN METROLOGY 12
Precision instruments based on laser-Principles- laser interferometer-application in measurements and machine tool metrology- Coordinate measuring machine (CMM): need, construction, types, applications.- computer aided inspection.
UNIT V  MEASUREMENT OF MECHANICAL PARAMETERS  
Force, torque, power:-mechanical, pneumatic, hydraulic and electrical type-Pressure measurement - Flow: Venturi, orifice, rotameter, pitot tube –Temperature: bimetallic strip, thermocouples, pyrometer, electrical resistance thermistor

TOTAL: 60 PERIODS

OUTCOMES:
- Upon completion of this course the student can able to learn the various linear and angular measuring equipments, their principle of operation and applications

TEXT BOOKS

REFERENCES

MF6502 METAL FORMING TECHNOLOGY  

<table>
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</table>

OBJECTIVES:
- To understand the principle, procedure and applications of Bulk Metal Forming and Sheet Metal Forming.

UNIT I  FUNDAMENTALS OF METAL FORMING  

UNIT II  FORGING AND ROLLING  

UNIT III  EXTRUSION AND DRAWING PROCESSES  

UNIT IV  SHEET METAL FORMING PROCESSES  
UNIT V  RECENT ADVANCES  10

TOTAL: 60 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to perform difficult forming process to make different shape components.

TEXT BOOKS:
2. Nagpal G.R. “Metal forming processes”, Khanna publishers, New Delhi, 2004

REFERENCES:

PR6502  ENGINEERING STATISTICS AND QUALITY CONTROL  L T P C
3 1 0 4

OBJECTIVES:
- To provide an introduction to fundamental concepts of statistical Process control
- Enhance the student understanding of the complexities of Statistical Analysis and control chart interpretation
- To understand the concept of reliability and it’s improving techniques and design of experiments

UNIT I  SAMPLING THEORY AND TESTING OF HYPOTHESIS  11

UNIT II  STATISTICAL PROCESS CONTROL  15
Variation in process – Factors – control charts – variables X R and X, , - Attributes P, C and U-Chart Establishing and interpreting control charts process capability – Quality rating – Short run SPC.

UNIT III  ACCEPTANCE SAMPLING  15
Lot by lot sampling types – probability of acceptance in single, double, multiple sampling plans – OC curves – Producer’s risk and consumer’s risk. AQL, LTPD, AOQL, Concepts Design of single sampling plan – standard sampling plans for AQL end LTPD – use of standard sampling plans – Sequential sampling plan.

UNIT IV  RELIABILITY AND QUALITY  10
UNIT V EXPERIMENTAL DESIGN AND TAGUCHI METHOD


TOTAL: 60 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to perform statistical analysis using different control chart and able to apply concept of reliability, and design of experiment for quality improvement.

TEXT BOOKS:

REFERENCES:

PR6503 MACHINE ELEMENTS DESIGN

OBJECTIVES:
- To introduce students to the design and theory of common machine elements and to give students experience in solving design problems involving machine elements.

UNIT I INTRODUCTION

UNIT II DETACHABLE AND PERMANENT JOINTS
Design of Bolts under Static Load, Design of Bolt with Tightening/Initial Stress, Design of Bolts subjected to Fatigue – Keys -Types, Selection of Square and Flat Keys-Design of Riveted Joints and Welded Joints

UNIT III SHAFTS, COUPLING AND BRAKES
Design of Shaft –For Static and Varying Loads, For Strength and Rigidity-Design of Coupling-Types, Flange, Muff and Flexible Rubber Bushed Coupling-Design of Brakes- Block and Band Brakes

UNIT IV GEARs AND BELT DRIVES
Design of Spur, Helical, Bevel and Worm Gear drives-Design of Belt drives-Flat and V Belts

UNIT V SPRINGS AND BEARINGS
Design of Helical Spring-Types, Materials, Static and Variable Loads-Design of Leaf Spring-Design of Journal Bearing -Antifriction Bearing-Types, Life of Bearing, Reliability Consideration, Selection of Ball and Roller Bearings

TOTAL: 60 PERIODS
OUTCOMES:
- Upon completion of this course, the students can able to successfully design engine components. The students can able to successfully design transmission components used in Engine and machines.

TEXT BOOKS:

REFERENCES:

PR6504 FOUNDRY TECHNOLOGY

OBJECTIVE:
- To understand the principle, procedure and applications of various foundry processes.

UNIT I CASTING PROCESS

UNIT II CASTING METALLURGY

UNIT III DESIGN OF GATING SYSTEMS
Gating systems and their characteristics; the effects of gates on aspiration; turbulence and dross trap; recent trends. Chvorinov’s Rule Riser design; risering curves; NRL method of riser design; feeding distance; risering of complex casting;

UNIT IV RECENT TRENDS IN CASTING AND FOUNDRY LAYOUT
Shell moulding, precision investment casting, CO2 moulding, centrifugal casting, Die casting, Continuous casting, Counter gravity low pressure casting, Squeeze casting and semisolid processes. Layout of mechanized foundry – sand reclamation – material handling in foundry pollution control in foundry — Computer aided design of casting.

UNIT V TESTING OF CASTINGS

TOTAL: 45 PERIODS
OUTCOME:
- Upon completion of this course, the students can able to design different casting system and use different Foundry practices to make practical component,
- To perform different testing to study the defect in the casting and apply engineering skills to minimise the defects.

TEXT BOOKS:

REFERENCES

PR6511  CNC MACHINE LABORATORY

OBJECTIVES:
To train the students to write CNC Programming to simulate tool path simulation for different components.

LIST OF EXPERIMENTS
1. Study of different control systems and NC codes.
2. Program for Turning, Facing operation.
3. Program for circular interpolation, Taper turning operation
4. Program for thread cutting operation
5. Program using Do-Loop and Sub-routine.
6. Program for profile milling operation, circular interpolation
7. Program for Circular, rectangular pocket milling
8. Program for drilling cycle
9. Program for tool compensation and Program offset
10. NC code generation using CAD software packages
11. Study of cam packages
12. Study of CNC Wire cut EDM

OUTCOME:
- Upon completion of this course, the students can able to perform programming on CNC machine and simulate tool path movement and also able to apply the programming to machine industrial components.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CNC Lathe / Turning Centre</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>CNC Milling Machine / Machining Centre</td>
<td>1</td>
</tr>
</tbody>
</table>
OBJECTIVES:
- To study the functional aspects of different pneumatic and hydraulic components and its usage in circuits.
- To train the students in designing different pneumatic and hydraulic circuits for different application.

LIST OF EXPERIMENTS
1. Study and use of pneumatic and hydraulic elements.
2. Simulation of speed control circuits in a hydraulic trainer.
3. Simulation of hydraulic circuits in a hydraulic trainer.
4. Simulation of single and double acting cylinder circuits using different directional control values
5. One shot and regenerative pneumatic circuits
6. Sequencing of pneumatic circuits
7. Simulation of Electro-pneumatic latch circuits
8. Simulation of Logic pneumatic circuits
9. Simulation of electro pneumatic sequencing circuits
10. Simulation of PLC based electro pneumatic sequencing circuits
11. Simulation of pneumatic circuits using PLC

TOTAL: 45 PERIODS

OUTCOME:
- Upon completion of this course, the students can able to select and apply different pneumatics and hydraulic components to design fluid power circuit

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hydraulic Trainer</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Electro Hydraulic Trainer</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>PLC Based Hydraulic Trainer</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Hydraulic Accumulator Intensifier, Press.</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Transparent Hydraulic &amp; Pneumatic Trainer</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Vane Pump Test Rig</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Pneumatic Trainer</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Electro Pneumatic Trainer</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>PLC Based Pneumatic Trainer</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Gear Pump Test Rig</td>
<td>1</td>
</tr>
</tbody>
</table>
OBJECTIVES:
- To provide opportunities to learners to practice their communicative skills to make them become proficient users of English.
- To enable learners to fine-tune their linguistic skills (LSRW) with the help of technology to communicate globally.
- To enhance the performance of learners at placement interviews and group discussions and other recruitment procedures.

UNIT I  LISTENING / VIEWING  10
Listening and note-taking – Listening to telephonic conversations – Ted talks – Inspiring Speeches – Watching documentaries on personalities, places, socio-cultural events, TV news programmes and discussions to answer different kinds questions, viz., identifying key idea and comprehension questions... so on.

UNIT II  SPEAKING  12

UNIT III  READING  10
Different genres of text (literature, media, technical) for comprehension – Reading strategies like note-making – reading graphs, charts and graphic organizer – Sequencing sentences – reading online sources like e-books, e-journals and e-newspapers.

UNIT IV  WRITING  12

UNIT V  VOCABULARY  8
Idioms and Phrases – Proverbs – Collocations – Chunks of language.

UNIT VI  GRAMMAR  8
Sentence structures – Subject-Verb agreement – Pronoun-Antecedent agreement – Tense forms – Active and passive voices – Direct and Indirect speeches – Cohesive devices.

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>Server</td>
<td>1 No.</td>
</tr>
<tr>
<td></td>
<td>System Details</td>
<td>Quantity</td>
</tr>
<tr>
<td>---</td>
<td>----------------</td>
<td>----------</td>
</tr>
<tr>
<td>1</td>
<td>Client Systems</td>
<td>60 Nos.</td>
</tr>
<tr>
<td></td>
<td>1 GB RAM / 40 GB HDD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OS: Win 2000 server</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Audio card with headphones</td>
<td></td>
</tr>
<tr>
<td></td>
<td>JRE 1.3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>PIII System</td>
<td>1 No.</td>
</tr>
<tr>
<td></td>
<td>256 or 512 MB RAM / 40 GB HDD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OS: Win 2000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Audio card with headphones</td>
<td></td>
</tr>
<tr>
<td></td>
<td>JRE 1.3</td>
<td></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>LCD Projector with MP3/CD/DVD provision for Audio/video facility</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**
- Online Test: 35 marks
- Interview: 15 marks
- Presentation: 15 marks
- Group Discussion: 15 marks

**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, case studies and abstract concept

**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:**


Web Sources:
www.humanresources.about.com
www.careerride.com

IE6605 PRODUCTION PLANNING AND CONTROL

OBJECTIVES:
- To understand the various components and functions of production planning and control such as work study, product planning, process planning, production scheduling, Inventory Control.
- To know the recent trends like manufacturing requirement Planning (MRP II) and Enterprise Resource Planning (ERP).

UNIT I INTRODUCTION
Objectives and benefits of planning and control-Functions of production control-Types of production - job batch and continuous-Product development and design-Marketing aspect - Functional aspects - Operational aspect-Durability and dependability aspect-aesthetic aspect. Profit consideration-Standardization, Simplification & specialization-Break even analysis-Economics of a new design.

UNIT II WORK STUDY
Method study, basic procedure-Selection-Recording of process - Critical analysis, Development - Implementation - Micro motion and memo motion study - work measurement - Techniques of work measurement - Time study - Production study - Work sampling - Synthesis from standard data - Predetermined motion time standards.

UNIT III PRODUCT PLANNING AND PROCESS PLANNING
Product planning-Extending the original product information-Value analysis-Problems in lack of product planning-Process planning and routing-Pre requisite information needed for process planning-Steps in process planning-Quantity determination in batch production-Machine capacity, balancing-Analysis of process capabilities in a multi product system.

UNIT IV PRODUCTION SCHEDULING
UNIT V INVENTORY CONTROL AND RECENT TRENDS IN PPC

Inventory control-Purpose of holding stock-Effect of demand on inventories-Ordering procedures. Two bin system -Ordering cycle system-Determination of Economic order quantity and economic lot size-ABC analysis-Recorder procedure-Introduction to computer integrated production planning systems-elements of JUST IN TIME SYSTEMS Fundamentals of MRP II and ERP.

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to prepare production planning and control activities such as work study, product planning, production scheduling, Inventory Control.
• They can plan manufacturing requirements manufacturing requirement Planning (MRP II) and Enterprise Resource Planning (ERP).

TEXT BOOK:

REFERENCES:

PR6601 COMPUTER AIDED PRODUCT DESIGN

OBJECTIVES:
• To introduce the concepts and applications of CAD
• To introduce the various concepts and techniques used for Product design and to develop product design skills.

UNIT I INTRODUCTION TO COMPUTER AIDED DESIGN
Introduction to Engineering Design – Various phases of systematic design – sequential engineering and concurrent engineering – Computer hardware & Peripherals – software packages for design and drafting.

UNIT II COMPUTER GRAPHICS FUNDAMENTALS
UNIT III GEOMETRIC MODELING

UNIT IV PRODUCT DESIGN CONCEPTS

UNIT V PRODUCT DATA MANAGEMENT

OUTCOMES:
• Upon completion of this course, the students can able to apply geometric modeling principles to design a component and also able to manage the product data and apply product life cycle management to industrial components.

TEXT BOOKS

REFERENCES

PR6602 AUTOMATED PRODUCTION AND COMPUTER INTEGRATED MANUFACTURING L T P C 3 1 0 4

OBJECTIVES:
• To understand the various automated manufacturing activities
• To study the application of computer Technology in the Manufacturing activities
• To know the smooth transition from conventional manufacturing to automated production and computer integrated manufacturing

UNIT I INTRODUCTION

UNIT II AUTOMATED PRODUCTION SYSTEMS AND MATERIAL HANDLING AND STORAGE SYSTEM

UNIT III GROUP TECHNOLOGY AND CELLULAR MANUFACTURING
12

UNIT IV FLEXIBLE MANUFACTURING SYSTEM
12

UNIT V AUTOMATED ASSEMBLY, COMPUTER PROCESS CONTROL AND SHOP FLOOR CONTROL
12

OUTCOMES:
Upon completion of this course, the students can able to
- Ability to group similar parts
- Ability to design FMS process
- Ability to constituent control that to calculate the amount of script to develop manufacturing plans.
- Ability to combine different concepts to describe computer integrated manufacturing

TOTAL: 60 PERIODS

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To introduce the concepts of various types of jigs, fixtures and dies
- To design and draw jig / fixture/ die for a given component

UNIT I LOCATION AND CLAMPING DEVICES IN JIGS AND FIXTURES

UNIT II DESIGN OF ELEMENTS OF JIGS AND FIXTURE
Design concepts of Template Jig, Plate Jig, Sandwich Jig, Vice Jaw Jig, Latch Jig, Turnover jig, Box jig – Fixtures for Milling, Grinding, Turning, Welding, and Assembly – Modular fixtures.

UNIT III PRESS WORKING OPERATION AND FORMING DIES
Blanking, Piercing, lancing, notching, bending design features of dies for drawing, extrusion, wire drawing and forging.

UNIT IV ELEMENTS OF DIE

UNIT V DESIGN AND DRAWING DIES, JIGS AND FIXTURES
Progressive die – compound die – Bending and drawing dies – Drill Jigs – Milling fixtures, turning fixtures.

Note: (Use of P S G Design Data Book is permitted in the University examination)

OUTCOMES:
- Upon completion of this course, the students can able to design jigs, fixtures and press tools and drawing.

TEXT BOOKS:

REFERENCES:
3. ASTME, Fundamentals of Tool design, Prentice Hall 1974

OBJECTIVES:
- To establish hands-on experience in sheet metal forming, bulge forming and Super plastic forming.
- To get hands on experience in machining gear, V-block, dovetail, etc.
To study tool wear, acceptance test for machine tool

METAL FORMING LAB:
1. Construction Flow Stress – Strain curve
2. Erichsen cupping Test
3. Determination of interface friction factor using ring compression test
4. Construction of FLD of sheet metal
5. Water hammer forming
6. Determination of Power consumption in sheet rolling process
7. Determination of strain rate sensitivity index of given specimen
8. Superplastic forming studies on Pb-Sn alloys
9. Deep drawing
10. Forward Extrusion process
11. Micro-forming
12. Simulation studies on metal forming

SPECIAL MACHINES LAB:
1. Gear Hobbing
   a. Spur Gear
   b. Helical Gear
2. Planning Machine
   a. V-Block
   b. Dove Tail
3. Centreless Cylindrical Grinding
4. Milling Machine
   a. Spur Gear
5. Tool And Cutter Grinding
6. Tool Wear Studies
7. Acceptance Test Of Machine Tool As Per ISI Test Chart
8. EDM
9. Capstan And Turret Lathe
10. Measurement Of Cutting Force

TOTAL: 60 PERIODS

OUTCOMES:
- Ability to perform sheet metal forming, bulge forming and super plastic forming
- Ability to machine raw materials to prepare gear, V-block, etc.,
- Ability to conduct acceptance test for machine tool.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Universal Testing Machine 10T</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Erichsen cupping Tester</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Hydraulic Press 50T</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Water hammer forming apparatus</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Two high Rolling mill</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Top open muffle furnace (Max 1200 oC)</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Dies for deep drawing</td>
<td>1 SET</td>
</tr>
<tr>
<td>8</td>
<td>Dies for Micro forming</td>
<td>1 SET</td>
</tr>
<tr>
<td>9</td>
<td>Dies for super plastic forming</td>
<td>1 SET</td>
</tr>
<tr>
<td>10</td>
<td>FEM package (ABAQUAS, ANSYS...)</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Dies for Constructing FLD of sheet metals</td>
<td>1 SET</td>
</tr>
</tbody>
</table>
OBJECTIVES
- To familiar with different measurement equipments and use of this industry for quality inspection

LIST OF EXPERIMENTS
1. Measurements of angle using Sine bar / bevel protractor
2. Measurement of External and internal Taper angle
3. Measurement of Bore Diameter
4. Calibration of Dial gauge
5. Measurement of Roundness
6. Measurements of Screw Thread Parameters using three-wire method
7. Measurements of Surface Roughness
8. Measurements using toolmaker Microscope
9. Measurements using Profile Projector
10. Measurements using Vision Measuring System
11. Measurements using CMM

TOTAL: 45 PERIODS

OUTCOMES
- Ability to handle different measurement tools and perform measurements in quality impulsion

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vernier Calipers 0-150 mm</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Vernier Calipers 0-300 mm</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Micrometer 0-25 mm</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Micrometer 25-50 mm</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Micrometer 50-75 mm</td>
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<tr>
<td>6</td>
<td>Dial gauges LC 10 micrometer</td>
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</tr>
<tr>
<td>7</td>
<td>Dial gauge L.C. 2 micrometer</td>
<td>12</td>
</tr>
<tr>
<td>8</td>
<td>Height gauge Analog</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Height gauge Digital</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Slip gauge set</td>
<td>2 SET</td>
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<tr>
<td>11</td>
<td>Sine Bar 100 mm</td>
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<td>12</td>
<td>Sine Bar 200 mm</td>
<td>2</td>
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<tr>
<td>13</td>
<td>Toolmakers microscope</td>
<td>1</td>
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<tr>
<td>14</td>
<td>Profile Projector</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>Gear tooth verniers</td>
<td>2</td>
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<tr>
<td>16</td>
<td>Flangernic 0-25</td>
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<td>17</td>
<td>Flangemic 25-50</td>
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<td>18</td>
<td>Floating carriage micrometer</td>
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<td>19</td>
<td>Thread plug gauges m24 x 3</td>
<td>1</td>
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<tr>
<td>20</td>
<td>Thread plug gauges m20 x 2.5</td>
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<tr>
<td>21</td>
<td>3 wire set box</td>
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</tr>
<tr>
<td>22</td>
<td>Surface roughness measuring Instrument</td>
<td>1</td>
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<tr>
<td>23</td>
<td>Precision spheres different dia</td>
<td>1 SET</td>
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<tr>
<td>24</td>
<td>Dial Guage Caliberator</td>
<td>1</td>
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<tr>
<td>25</td>
<td>Precision level</td>
<td>1</td>
</tr>
<tr>
<td>26</td>
<td>Digital Micrometer</td>
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</tr>
<tr>
<td>27</td>
<td>Digital Vernier 0-150 mm</td>
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</tr>
</tbody>
</table>
PR6613 WELDING AND FOUNDRY LABORATORY

OBJECTIVES

- To familiarize the students with test procedures followed in foundry and to practice various types of welding processes.

LIST OF EXPERIMENTS

Welding

- Study of different welding equipments and accessories: Gas, Electric Welding
- Oxy-acetylene gas welding of Lap joint, Butt Joint and T Joint.
- Electric arc welding of Lap Joint, Butt Joint, and T Joint.
- Welding of pipes in different positions.
- Brazing practice – furnace brazing.
- Brazing welding of cast iron.
- Thermit welding of thick material like rod plates etc.

Foundry

- Preparation of green moulding sand using a 5 kg muller and testing for
  - Compression, shear, tensile, transverse strengths, hardness in green condition:
  - ii. in dry condition after drying in oven at 150°C for one and half hour.
- Permeability testing.
- Determining the clay content.
- Sieve analysis of dry silica sand.
- Determining the moisture content by various methods.
- Melting any non-ferrous metal and making simple castings - Demonstration.

TOTAL: 60 PERIODS

OUTCOMES:

- Ability to perform different welding operations to form the metals
- Ability to carryout the foundry practices and perform different test required to characteristic transfer materials.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5 Kg Muller</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Sand rammer</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Weighing balance</td>
<td>1</td>
</tr>
</tbody>
</table>
GE6757 TOTAL QUALITY MANAGEMENT

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

UNIT I INTRODUCTION

UNIT II TQM PRINCIPLES
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
The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT IV TQM TOOLS AND TECHNIQUES II

UNIT V QUALITY SYSTEMS

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

TEXTBOOK:
REFERENCES:

ME6702 MECHATRONICS L T P C 3 0 0 3

OBJECTIVES:
• To impart knowledge about the elements and techniques involved in Mechatronics systems which are very much essential to understand the emerging field of automation.

UNIT I INTRODUCTION

UNIT II 8085 MICROPROCESSOR AND 8051 MICROCONTROLLER

UNIT III PROGRAMMABLE PERIPHERAL INTERFACE

UNIT IV PROGRAMMABLE LOGIC CONTROLLER
Introduction – Basic structure – Input and output processing – Programming – Mnemonics – Timers, counters and internal relays – Data handling – Selection of PLC.

UNIT V ACTUATORS AND MECHATRONIC SYSTEM DESIGN

TOTAL : 45 PERIODS

OUTCOMES:
• Upon completion of this course, the Students can able to design mechatronics system with the help of Microprocessor, PLC and other electrical and Electronics Circuits.

TEXT BOOKS:
REFERENCES:

PR6701    FINITE ELEMENT ANALYSIS IN MANUFACTURING IN ENGINEERING

OBJECTIVES:
- To introduce the concept of FEM and to apply in the field of Manufacturing Engineering

UNIT I    INTRODUCTION

UNIT II    GENERAL PROCEDURE OF FET
Discretization of Domain selection of interpolation polynomials-Convergence requirements-Formulation of element characteristics matrices and load vectors - Assembly of element characteristics matrices-Solution of finite element equations-Post processing of results.

UNIT III    FINITE ELEMENT ANALYSIS OF ONE DIMENSIONAL AND TWO DIMENSIONAL PROBLEMS
One dimensional finite element analysis-Linear bar element-Quadratic bar element-Beam element-Frame elements-One dimensional heat transfer-Two dimensional finite element analysis approximation of geometry and field variables-Three nodded triangular element-Four nodded rectangular element-Six nodded triangular element-Natural coordinates and coordinate transformation – Numerical integration-Incorporation of boundary conditions

UNIT IV    ISO-PARAMETRIC ELEMENTS
Iso-parametric elements-Dynamic analysis-Equations of motion using Lagrange’s approach-Consistent and Lumped mass matrices-Formulation of FE equations for vibration problems-Solution of Eigen value problems-Transient vibration analysis-Thermal transients.

UNIT V    APPLICATION OF FINITE ELEMENT ANALYSIS

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the Students can able to
- Develop element stiffness matrix equation from spring elements
- Assemble element matrix equation in to a global matrix
- Enforce boundary condition and forces on the system.
- Solve the resulting system and interpret result.
- Develop the concept of local, global coordinate system and their transformation.
TEXT BOOKS:

REFERENCES:

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ME6010 ROBOTICS

OBJECTIVES:
- To understand the functions of the basic components of a Robot.
- To study the use of various types of End of Effectors and Sensors
- To impart knowledge in Robot Kinematics and Programming
- To learn Robot safety issues and economics.

UNIT I  FUNDAMENTALS OF ROBOT  6
Robot - Definition - Robot Anatomy - Coordinate Systems, Work Envelope Types and Classification-Specifications-Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load- Robot Parts and their Functions-Need for Robots-Different Applications.

UNIT II  ROBOT DRIVE SYSTEMS AND END EFFECTORS  9
Pneumatic Drives-Hydraulic Drives-Mechanical Drives-Electrical Drives-D.C. Servo Motors, Stepper Motors, A.C. Servo Motors-Salient Features, Applications and Comparison of all these Drives, End Effectors-Grippers-Mechanical Grippers, Pneumatic and Hydraulic Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations.

UNIT III  SENSORS AND MACHINE VISION  12

UNIT IV  ROBOT KINEMATICS AND ROBOT PROGRAMMING  13
Forward Kinematics, Inverse Kinematics and Difference; Forward Kinematics and Reverse Kinematics of manipulators with Two, Three Degrees of Freedom (in 2 Dimension), Four Degrees of freedom (in
3 Dimension) Jacobians, Velocity and Forces-Manipulator Dynamics, Trajectory Generator, Manipulator Mechanism Design-Derivations and problems. Lead through Programming, Robot programming Languages-VAL Programming-Motion Commands, Sensor Commands, End Effector commands and simple Programs.

UNIT V IMPLEMENTATION AND ROBOT ECONOMICS 5
RGV, AGV; Implementation of Robots in Industries-Various Steps; Safety Considerations for Robot Operations - Economic Analysis of Robots.

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to apply the basic engineering knowledge for the design of robotics

TEXT BOOKS:

REFERENCES:

MF6711 COMPUTER AIDED SIMULATION AND ANALYSIS LABORATORY L T P C
0 0 3 2

OBJECTIVES:
• To give exposure to software tools needed to analyze engineering problems.
• To expose the students to different applications of simulation and analysis tools.

LIST OF EXPERIMENTS:
A. SIMULATION
1. MATLAB basics, Dealing with matrices, Graphing-Functions of one variable and two variables
2. Use of Matlab to solve simple problems in vibration
3. Mechanism Simulation using software

B. ANALYSIS
1. Force and Stress analysis using link elements in Trusses, cables etc.
2. Stress and deflection analysis in beams with different support conditions.
3. Stress analysis of flat plates and simple shells.
5. Thermal stress and heat transfer analysis of plates.
7. Vibration analysis of spring-mass systems.
8. Model analysis of Beams.
9. Harmonic, transient and spectrum analysis of simple systems.

**TOTAL: 45 PERIODS**

**OUTCOME**
- To train the students to make use of software for simulation and analysis for various applications in the field of manufacturing engineering.

**TEXT BOOKS:**

**EQUIPMENTS FOR A BATCH OF 30 STUDENTS**

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**PR6711 MICROPROCESSOR AND MECHATRONICS LABORATORY**

**OBJECTIVES:**
- To expose the students to use the microprocessor to perform simple operations / Programming
- To design and develop hydraulic pneumatic and electrical circuits using simulating systems
- To study the characteristic of different hydraulic, pneumatic and electrical components.

**MICROPROCESSOR LABORATORY**

**LIST OF EXPERIMENTS**
1. Addition and subtraction of two 16-bit numbers
2. Sorting a series of numbers in Ascending and Descending order
3. Conversion of Binary number to BCD
4. Conversion of BCD to Binary
5. Implementation of Block-Data transfer
6. Controlling stepper motor using Microprocessor
7. Verification of Logic gates
8. Design of adders and subtractors
9. Multiplexer and Demultiplexer
10. Applications of an OPAMP
11. Characteristics of common emitter transistor
12. Transfer and Drain Characteristics of FET amplifier

**MECHATRONICS LABORATORY**

**LIST OF EXPERIMENTS**
1. Design and testing of fluid power circuits to control
   (i) Velocity (ii) direction and (iii) force of single and double acting actuators
2. Design of circuits with logic sequence using Electro pneumatic trainer kits.
3. Simulation of basic Hydraulic, Pneumatic and Electric circuits using software
4. Circuits with multiple cylinder sequences in Electro pneumatic using PLC
5. Speed Control of AC & DC drives
6. Servo controller interfacing for DC motor
7. PID controller interfacing
8. Stepper motor interfacing with 8051 Micro controller
   (i) full step resolution (ii) half step resolution
9. Modeling and analysis of basic electrical, hydraulic and pneumatic systems
   Using appropriate softwares
10. Computerized data logging system with control for process variables like pressure,
    flow and temperature.

**OUTCOMES:**
- Ability to use the microprocessor to perform simple programme
- Ability to use microprocessor, PID controller for interface
- Ability to perform testing on fluid power inverter
- Ability to simulate circuits using hydraulic, Pneumatic and electrical components.

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

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Basic Pneumatic Trainer Kit with manual and electrical controls/PLC Control</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>Basic Hydraulic Trainer Kit</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Hydraulics and Pneumatics Systems Simulation Softwares</td>
<td>10 SET</td>
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<tr>
<td>4</td>
<td>8051 - Microcontroller kit with stepper motor and drive circuit</td>
<td>2 SET</td>
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<tr>
<td>5</td>
<td>Simulation Softwares and Sensors to measure Pressure, Flow rate, direction, speed,</td>
<td>2 SET</td>
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<td></td>
<td>velocity and force</td>
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</table>

**PR6712 DESIGN AND FABRICATION PROJECT**

**OBJECTIVES:**
- The main objective is to give an opportunity to the student to get hands on training in the fabrication of one or more components of a complete working model, which is designed by them.

**GUIDELINE FOR REVIEW AND EVALUATION**

The students may be grouped into 2 to 4 and work under a project supervisor. The device/system/component(s) to be fabricated may be decided in consultation with the supervisor and if possible with an industry. A project report to be submitted by the group and the fabricated model, which will be reviewed and evaluated for internal assessment by a Committee constituted by the Head of the Department. At the end of the semester examination 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.

**OUTCOMES:**
- Use of design principles and develop conceptual and engineering design of any components.
- Ability to fabricate any components using different manufacturing tools.
OBJECTIVES:
- To introduce the process planning concepts to make cost estimation for various products after process planning

UNIT I  INTRODUCTION TO PROCESS PLANNING  10
Introduction- methods of process planning-Drawing interpretation-Material evaluation – steps in process selection-.Production equipment and tooling selection

UNIT II  PROCESS PLANNING ACTIVITIES  10
Process parameters calculation for various production processes-Selection jigs and fixtures election of quality assurance methods - Set of documents for process planning-Economics of process planning- case studies

UNIT III  INTRODUCTION TO COST ESTIMATION  8
Importance of costing and estimation –methods of costing-elements of cost estimation –Types of estimates – Estimating procedure- Estimation labor cost, material cost- allocation of over head charges- Calculation of depreciation cost

UNIT IV  PRODUCTION COST ESTIMATION  8
Estimation of Different Types of Jobs - Estimation of Forging Shop, Estimation of Welding Shop, Estimation of Foundry Shop

UNIT V  MACHINING TIME CALCULATION  9
Estimation of Machining Time - Importance of Machine Time Calculation- Calculation of Machining Time for Different Lathe Operations ,Drilling and Boring - Machining Time Calculation for Milling, Shaping and Planning -Machining Time Calculation for Grinding

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to use the concepts of process planning and cost estimation for various products.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To encourage the students to comprehend the knowledge acquired from the first Semester to Sixth Semester of B.E Degree Course through periodic exercise.

METHOD OF EVALUATION:
The students will be assessed 100% internally through weekly test with objective type questions on all the subject related topics

OUTCOMES:
- ability to understand and comprehend any given problem related to mechanical engineering field.

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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.

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.

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OBJECTIVES:
- To learn about various unconventional machining processes, the various process parameters and their influence on performance and their applications

UNIT I INTRODUCTION
UNIT II MECHANICAL ENERGY BASED PROCESSES 9
Abrasive Jet Machining – Water Jet Machining – Abrasive Water Jet Machining - Ultrasonic
Machining.(AJM, WJM, AWJM and USM). Working Principles – equipment used – Process
parameters – MRR- Applications.

UNIT III ELECTRICAL ENERGY BASED PROCESSES 9
Electric Discharge Machining (EDM)- working Principle-equipments-Process Parameters-Surface
Finish and MRR- electrode / Tool – Power and control Circuits-Tool Wear – Dielectric – Flushing –
Wire cut EDM – Applications.

UNIT IV CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES 11
Chemical machining and Electro-Chemical machining (CHM and ECM)-Etchants – Maskant -
techniques of applying maskants - Process Parameters – Surface finish and MRR-Applications.
Principles of ECM- equipments-Surface Roughness and MRR Electrical circuit-Process Parameters-
ECG and ECH - Applications.

UNIT V THERMAL ENERGY BASED PROCESSES 10
Laser Beam machining and drilling (LBM), plasma Arc machining (PAM) and Electron Beam

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to demonstrate different unconventional
machining processes and know the influence of difference process parameters on the
performance and their applications.

TEXT BOOKS:
2. Pandey P.C. and Shan H.S. “Modern Machining Processes” Tata McGraw-Hill, New Delhi,
2007.

REFERENCES:

MF6503 PRECISION ENGINEERING

OBJECTIVES:
• To impart knowledge in the increasing quality concepts of parts, accuracy requirement of machine
tools and also to introduce latest topics in Manufacturing like micro machining and smart materials
so as to equip them to join core electronic manufacturing industries.

UNIT I CONCEPTS OF ACCURACY AND MACHINE TOOLS 9
Part Accuracy – errors, accuracy of machine tools – spindle accuracy – displacement accuracy –
errors due to numerical interpolation – definition of accuracy of N.C system – errors in the NC
machines – feed stiffness – zero stability.
UNIT II STIFFNESS, THERMAL EFFECTS AND FINISH MACHINING 12

UNIT III DIMENSIONING 6
Definition of terms – Key dimension – Superfluous dimension – dimensional stepped shaft – assigning tolerances in the constituent dimensions – dimensional chains.

UNIT IV MICRO-MACHINING MICRO FABRICATION 9

UNIT V SMART STRUCTURES, MATERIALS AND MICRO ACTUATORS 9

OUTCOMES
• Upon completion of this course the student can able to use of quality concepts parts, accuracy requirements of machine tools and use of latest machining process such as micro machining and micro fabrication.

TEXT BOOKS:

REFERENCES:

PR6001 SURFACE ENGINEERING L T P C
3 0 0 3

OBJECTIVES:
• To study the surface preparation techniques
• To import knowledge on thermal spraying process and electrodeposited coating
• To study the process of Hot dip and diffusion coating
• To induce the testing procedure for surface coating

UNIT I METAL CLEANING AND PREVIEW ON SURFACE ENGINEERING 8
UNIT II THERMAL SPRAYING PROCESSES AND ELECTRODEPOSITED COATINGS


UNIT III HOT DIP COATING AND DIFFUSION COATINGS


UNIT IV NON-METALLIC COATING OXIDE AND COVENSION COATINGS


UNIT V QUALITY ASSURANCE, TESTING AND SELECTION OF COATINGS


TOTAL: 45 PERIODS

OUTCOMES:

- Explain the important of surface engineering to industries
- Use of thermal spray for coating
- Explain the process and mechanism of different diffusion coating process
- Explain the methods of non metallic coating
- Explain the testing procedure for quality assurance.

TEXT BOOKS:


REFERENCES:


ME6015 OPERATIONS RESEARCH

OBJECTIVES:

- To provide knowledge and training in using optimization techniques under limited resources for the engineering and business problems.
UNIT I  LINEAR MODELS  15

UNIT II  TRANSPORTATION MODELS AND NETWORK MODELS  8

UNIT III  INVENTORY MODELS  6
Inventory models – Economic order quantity models – Quantity discount models – Stochastic inventory models – Multi product models – Inventory control models in practice.

UNIT IV  QUEUEING MODELS  6
Queueing models - Queueing systems and structures – Notation parameter – Single server and multi server models – Poisson input – Exponential service – Constant rate service – Infinite population – Simulation.

UNIT V  DECISION MODELS  10

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can be able to use the optimization techniques for use engineering and Business problems.

TEXT BOOK:

REFERENCES:

MG6072  MARKETING MANAGEMENT  L T P C
3 0 0 3

OBJECTIVES:
- To enable students to deal with newer concepts of marketing concepts like strategic marketing segmentation, pricing, advertisement and strategic formulation. The course will enable a student to take up marketing as a professional career.

UNIT I  MARKETING PROCESS  9
Definition, Marketing process, dynamics, needs, wants and demands, marketing concepts, environment, mix, types. Philosophies, selling versus marketing, organizations, industrial versus consumer marketing, consumer goods, industrial goods, product hierarchy.
UNIT II  BUYING BEHAVIOUR AND MARKET SEGMENTATION  
Cultural, demographic factors, motives, types, buying decisions, segmentation factors - demographic - Psycho graphic and geographic segmentation, process, patterns.

UNIT III  PRODUCT PRICING AND MARKETING RESEARCH  
Objectives, pricing, decisions and pricing methods, pricing management. Introduction, uses, process of marketing research.

UNIT IV  MARKETING PLANNING AND STRATEGY FORMULATION  
Components of marketing plan-strategy formulations and the marketing process, implementations, portfolio analysis, BCG, GEC grids.

UNIT V  ADVERTISING, SALES PROMOTION AND DISTRIBUTION  

OUTCOME:
- The learning skills of Marketing will enhance the knowledge about Marketer’s Practices and create insights on Advertising, Branding, Retailing and Marketing Research.

TEXTBOOKS:

REFERENCES:

PR6002  FUZZY LOGIC AND ANN  L T P C  3 0 0 3

OBJECTIVES:
- To impact knowledge on fuzzy logic principles
- To understand models of ANN
- To use the fuzzy logic and neural network for application related to design and manufacture

UNIT I  INTRODUCTION TO FUZZY LOGIC PRINCIPLES  
UNIT II ADVANCED FUZZY LOGIC APPLICATIONS

UNIT III INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS

UNIT IV OTHER ANN ARCHITECTURES

UNIT V RECENT ADVANCES

OUTCOMES:
- Develop the skill in basic understanding on fuzzy and neural network
- Explore the functional components of neural classification conducer and the functional components of fuzzy logic classification on controller.
- Develop and implement a basic trainable neural network (or) a fuzzy logic system to design and manufacturing.

TEXT BOOKS:

REFERENCES:
UNIT I  INTRODUCTION  9
Static and dynamic characteristics of measurement systems, standards and calibration, error and uncertainty analysis, statistical analysis of data, and curve fitting.

UNIT II  MECHANICAL MEASUREMENTS AND INDUSTRIAL INSTRUMENTATION  10
Measurement of displacement, velocity (linear and rotational), acceleration, shock, vibration, force torque power, strain, stress, pressure temperature.

UNIT III  DATA DISPLAY AND RECORDING DEVICES  8
Data display-CRO, LED, LCD, magnetic tape recorders, x-y recorders, UV recorders, Oscilloscope recorders, digital printers and data loggers.

UNIT IV  CONTROL  9
Introduction to control systems, mathematical model of physical systems in transfer function and state space forms, response of dynamic systems, concept of pole and zero of a system, realization of transfer functions.

UNIT V  STABILITY ANALYSIS  9
Stability criteria bode plots, routh and nyquist criteria.

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of this course student can able to perform measurement of displacement, velocity, force, torque, strain, stress, pressure and temperature.

TEXT BOOKS:

REFERENCES:

GE6081  FUNDAMENTALS OF NANOSCIENCE  L T P C
3 0 0 3

OBJECTIVES
• To learn about basis of nanomaterial science, preparation method, types and application

UNIT I  INTRODUCTION  8
Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering- Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).
UNIT I GENERAL METHODS OF PREPARATION 9
Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III NANOMATERIALS 12
Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications- Nanometal oxides-ZnO, TiO2,MgO, ZrO2, NiO, nanoalumina, CaO, AgTiO2, Ferrites, Nanoclays-functionalization and applications-Quantum wires, Quantum dots-preparation, properties and applications

UNIT IV CHARACTERIZATION TECHNIQUES 9
X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation

UNIT V APPLICATIONS 7

TOTAL : 45 PERIODS

OUTCOMES
• Will familiarize about the science of nanomaterials
• Will demonstrate the preparation of nanomaterials
• Will develop knowledge in characteristic nanomaterial

TEXT BOOKS

REFERENCES

PR6004 DESIGN OF MACHINE TOOL STRUCTURE L T P C
3 0 0 3

OBJECTIVES:
• To understand different machine tools used for machining.
• To understand the design criteria for machine tool structures.
• To know the designing of slideways
• To understand the vibration in the machine tool during operation.
UNIT I INTRODUCTION

UNIT II STRENGTH AND RIGIDITY OF MACHINE TOOL STRUCTURES

UNIT III SLIDEWAYS

UNIT IV SPINDLES AND SPINDLE SUPPORTS

UNIT V MACHINE TOOL DYNAMICS

TOTAL: 45 PERIODS

OUTCOMES
• Ability to design strength and components of machine tools.

TEXT BOOKS:

REFERENCES:

ME6007 COMPOSITE MATERIALS AND MECHANICS

OBJECTIVES:
• To understand the fundamentals of composite material strength and its mechanical behavior
• Understanding the analysis of fiber reinforced Laminate design for different combinations of plies with different orientations of the fiber.
• Thermo-mechanical behavior and study of residual stresses in Laminates during processing.
• Implementation of Classical Laminate Theory (CLT) to study and analysis for residual stresses in an isotropic layered structure such as electronic chips.

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UNIT I INTRODUCTION, LAMINA CONSTITUTIVE EQUATIONS & MANUFACTURING


UNIT II FLAT PLATE LAMINATE CONSTITUTE EQUATIONS


UNIT III LAMINA STRENGTH ANALYSIS


UNIT IV THERMAL ANALYSIS


UNIT V ANALYSIS OF LAMINATED FLAT PLATES


TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to analyse the fiber reinforced Laminate for optimum design
- Apply classical laminate theory to study and analyse the residual stresses in Laminate.

TEXT BOOKS:


REFERENCES:

OBJECTIVES
To understand the characteristics of different reinforcement matrix materials
- To develop composite materials for different application.
- To know the different process used for polymer matrix composites, metal matrix composites and ceramics matrix composites

UNIT I INTRODUCTION

UNIT II POLYMER MATRIX COMPOSITES

UNIT III METAL MATRIX COMPOSITES

UNIT IV CERAMICS MATRIX COMPOSITES

UNIT V ADVANCES IN POLYMERS & COMPOSITES

OUTCOMES
- Ability to select suitable matrix, reinforce materials for polymer matrix composites, metal matrix composites and ceramics matrix composites

TEXT BOOKS:

REFERENCES:
5. Brydson, Hand book of plastic processing

PR6006 NON DESTRUCTIVE TESTING METHODS L T P C
3 0 0 3

OBJECTIVES:
- To understand principle behind various NDT techniques.
- To study about NDT equipments and accessories.
- To learn working procedures of various NDT techniques.

UNIT I NON-DESTRUCTIVE TESTING: AN INTRODUCTION 6
Introduction to various non-destructive methods- Comparison of Destructive and Non destructive Tests, Visual Inspection, Optical aids used for visual inspection, Applications.

UNIT II LIQUID PENETRANT TESTING AND MAGNETIC PARTICLE TESTING 10
Physical principles, procedure for penetrant testing, Penetrant testing materials, Penetrant testing methods – Applications Principle of MPT, Magnetising technical and procedure used for testing a component, Equipment used for MPT, Applications.

UNIT III EDDY CURRENT TESTING AND ACOUSTIC EMISSION TESTING 10

UNIT IV ULTRASONIC TESTING 10
Principle, Ultrasonic transducers, Inspection Methods – Normal Incident Pulse-echo Inspection, Through - transmission Testing, angle Beam Pulse-echo testing, Techniques for Normal Beam Inspection, Ultrasonic Flaw detection Equipment, Modes of display – Ascan, B-Scan & C- Scan- Applications

UNIT V RADIOGRAPHY, COMPARISON AND SELECTION OF NDT METHODS 9
Basic principle, Effect of radiation on Film, Radiographic imaging – Inspection Techniques – Single wall single image, Double wall Penetration & Multiwall Penetration technique – Comparison and selection of various NDT techniques.

TOTAL: 45 PERIODS

OUTCOMES
- Ability to defect the flow and other defects using non destructive testing procedure for industrial component.

TEXT BOOKS:
REFERENCES:
3. www.ndt.net

PR6007 SIMULATION OF MANUFACTURING SYSTEMS

OBJECTIVES:
- To introduce the concepts of simulation and to apply them for manufacturing system

UNIT I INTRODUCTION

UNIT II RANDOM NUMBERS

UNIT III DESIGN OF SIMULATION EXPERIMENTS

UNIT IV SIMULATION LANGUAGE
Study of GPSS (Basic blocks only) Generate, Queue, Depart, Size, Release, Advance, Terminate, Transfer, Enter and Leave.

UNIT V CASE STUDIES
Development of simulation models using GPSS for queuing, production, inventory, maintenance and replacement systems, (Students may be asked to prepare and present the case studies)

TOTAL: 45 PERIODS

OUTCOMES
- Use of concepts of simulation to the manufacturing systems.

TEXT BOOK:

REFERENCES:
PR6008          MACHINE VISION   L T P C
                        3 0 0 3

OBJECTIVES:

- To understand the principle, importance and application of machine vision system in Manufacturing and measurement.

UNIT I    INTRODUCTION TO MACHINE VISION

Machine Vision use of machine vision – tasks for a vision system – relation to other fields – place of vision in CIM.

UNIT II  IMAGE ACQUISITION AND CONVERSION


UNIT III  IMAGE PROCESSING DECISION MAKING

Processing of binary images – thresholding, geometrical properties, topological properties – processing of gray scale images statistical operations, spatial operations, segmentation edge detection, morphological operations – image analysis – factors extraction – decision making.

UNIT IV   PATTERN RECOGNITION


UNIT V   MACHINE VISION APPLICATIONS

Applications in user industries automotive, semiconductor, electronic manufacturing, printing industries etc. – generic applications founding manufacturing metrology, inspection assembly verification – application analysis and implementation.

TOTAL: 45 PERIODS

OUTCOMES

- Use of machine vision techniques to pattern recognizing.
- Use of machine vision in manufacturing industries in process implementation, assembly.

TEXTBOOK


REFERENCES:

1. Richard O.Duda, Peter E. Hurt, Pattern Classification and Scene Analysis Publisher, 1973
OBJECTIVES

- To study the evolution of Management
- To study the functions and Production management
- To learn the application of the principles in an organization

UNIT I PRINCIPLES OF MANAGEMENT AND PERSONNEL MANAGEMENT


UNIT II INVENTORY MANAGEMENT

Purpose of Inventory – Cost related to inventors – Basic EOQ model – variations in EOQ model – Finite Production quality discounts – ABC Analysis – MRP Analysis.

UNIT III OPERATIONS MANAGEMENT


UNIT IV FINANCIAL MANAGEMENT


UNIT V MARKETING MANAGEMENT


OUTCOMES

- Ability to use inventory Management, Operation Management, Financial Management, Manufacturing Management and Industrial Development.

TEXT BOOKS:


REFERENCES:

OBJECTIVES:
- To introduce the concepts of man machine systems and techniques of providing human comfort in man-making work systems.

UNIT I INTRODUCTION

UNIT II WORK SPACE DESIGN
Anthropometry – workspace design for standing and seatedworkers – Arrangements of components within a physical space – Interpersonal aspect of workplace design.

UNIT III DESIGN OF EQUIPMENT
Programme factors to be considered, design of displays and controls – design for maintainability – heat stresses – manual lifting.

UNIT IV DESIGN FOR ENVIRONMENT

UNIT V RECENT ADVANCES AND TRENDS
Legislative trends – Trends in work system design – occupational diseases – Application of Ergonomics in automobiles.

TOTAL: 45 PERIODS

OUTCOMES
- Use the concept of ergonomics design in equipment
- Perform work space design considering physical space and inter personal space.

TEXT BOOK:

REFERENCES:

OBJECTIVES:
- To enable students to understand and interpret the basic financial statements, to comprehend the basics in managing finance and to know pricing mechanism.
UNIT I  INTRODUCTION

UNIT II  FINANCIAL ACCOUNTING

UNIT III  PROFIT VALUE ANALYSIS
Cost volume profit analysis – relevant costs in decision making profit management analysis – break even analysis – margin of safety, Angle of incidence & multi product break even analysis.

UNIT IV  WORKING CAPITAL MANAGEMENT

UNIT V  CAPITAL BUDGETING
Significance of capital budgeting – payback period – present value method – Accounting rate of return method, Internal Rate of Return.

TOTAL: 45 PERIODS

OUTCOME:
• Upon successful completion of this course, students will get the ability to prepare and interpret financial statements, manage funds efficiently and fix and revise prices as warranted.

TEXTBOOKS:

REFERENCES:

PR6011 PURCHASING AND MATERIALS MANAGEMENT

OBJECTIVES
• To impact knowledge on general structure of material management
• To understand the general procedure and structures of purchase management
• To understand and train the students in materials planning and solve forecasting related problems
• To understand inventory management and to study different models

UNIT I  FUNCTIONS OF MATERIALS MANAGEMENT
Introduction to materials management – objectives – Organization – Functions – Operating Cycle – Value analysis – Make or buy decisions.
UNIT II PURCHASING MANAGEMENT 8
Purchasing policies and procedures – Selection of sources of supply – Vendor development – Vendor evaluation and rating – Methods of purchasing – Imports – Buyer – Seller relationship – Negotiations - Insurance and claims managements

UNIT III STORES MANAGEMENT 8

UNIT IV MATERIALS PLANNING 12
Forecasting - ABC analysis – Materials requirements planning - Inventory systems – Quantity – periodic – Deterministic models – Aggregate planning – JIT.

UNIT V INVENTORY MANAGEMENT 11

TOTAL: 45 PERIODS

OUTCOMES
• To explain the functions and structure of materials, purchase and store management
• To perform analysis on materials planning
• To perform calculation using different inventory models.

TEXT BOOK:

REFERENCES:

OBJECTIVES:
• To introduce the advanced OR models and to apply them for Engineering problems.

UNIT I INTRODUCTION 5

UNIT II CLASSIC OPTIMIZATION TECHNIQUES 10

UNIT III NON-LINEAR PROGRAMMING 9
UNIT IV INTEGER PROGRAMMING

UNIT V DYNAMIC PROGRAMMING
Formulation – Application to capital budgeting, reliability improvement, shortest path, solution of LP using DP.

TOTAL: 45 PERIODS

OUTCOMES
• Upon completion of this course, the students can able to use the optimization techniques for use engineering and Business problems

TEXT BOOKS:

REFERENCES:

IE6603 RELIABILITY ENGINEERING

OBJECTIVES:
• To stress the importance of reliability in Engineering and products also the concept of maintainability, failure modes and testing methods.

UNIT I CONCEPTS OF RELIABILITY, SYSTEM AND MODELS

UNIT II DESIGN FOR RELIABILITY AND MAINTAINABILITY

UNIT III OPTIMIZATION OF SYSTEM RELIABILITY
Optimization techniques for system reliability with redundancy – heuristic methods applied to optimal system reliability- redundancy allocation by dynamic programming – reliability optimization by non linear programming.

UNIT IV THE ANALYSIS OF FAILURE DATA AND RELIABILITY TESTING

UNIT V PACKAGING AND TRANSPORTATION FOR RELIABILITY

TOTAL: 45 PERIODS

OUTCOMES
- The Student must apply and optimize reliability for time independent and time dependent failure models through various testing methods for various manufacturing amnesty process

TEXT BOOKS:

REFERENCES:

PR6013 MACHINE TOOL CONTROL AND CONDITION MONITORING

OBJECTIVES:
- To understand the control system of machine tools and its applications
- To understand the objectives, aims and methodology of machine tool condition monitoring and diagnostics.

UNIT I OVERVIEW OF AUTOMATIC CONTROLS IN MACHINE TOOLS
Open loop – closed loop system – block diagram representation of machine tool control systems.
UNIT II  COMPUTER CONTROL SYSTEM  15

UNIT III  DRIVE SYSTEMS IN MACHINE TOOLS  8
Electrical, hydraulic and pneumatic types – servo motor-stepper motor-ball screw mechanism. Feed back devices-Syncro, resolver, diffraction gratings, potentiometer, and inductosyn-encoders-application in machine tools.

UNIT IV  CONDITION MONITORING  8
Condition monitoring techniques – Visual, temperature, vibration, lubricant, thickness, noise and sound. Condition monitoring of machine tools.

UNIT V  MACHINE TOOL DIAGNOSTICS  8
Objectives-aims-examples of monitoring and diagnosis-control structures for machine diagnosis-utilization of diagnostic results.

OUTCOMES
• Ability to use different techniques to monitor the machine tool to prevent from failures.

TEXTBOOK

REFERENCES:

PR6014  MINI PROJECT  L T P C  0 0 6 3

OBJECTIVES:
1. The students in batches (not exceeding three in a batch) have to take up a project in the area of manufacturing engineering.
2. Each batch is guided by a faculty member. The students have to select a suitable problems, design, prepare the drawings, produce the components, assemble and commission the project.
3. The students have to prepare and present a detailed project report at the end of the VIII semester.
4. The evaluation will ne made for the continuous internal assessment for the Project by a committee nominated by the Head of the Department.
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

UNIT II   ENGINEERING ETHICS

UNIT III  ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV   SAFETY, RESPONSIBILITIES AND RIGHTS

UNIT V    GLOBAL ISSUES

TOTAL: 45 PERIODS

OUTCOME :
- 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:
OBJECTIVES:

- To develop and strengthen entrepreneurial quality and motivation in students and to impart basic entrepreneurial skills and understanding to run a business efficiently and effectively.

UNIT I - ENTREPRENEURSHIP


UNIT II - MOTIVATION

Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.

UNIT III - BUSINESS


UNIT IV - FINANCING AND ACCOUNTING


UNIT V - SUPPORT TO ENTREPRENEURS


TOTAL : 45 PERIODS

OUTCOMES:

- Upon completion of the course, students will be able to gain knowledge and skills needed to run a business successfully.

TEXTBOOKS:


REFERENCES:


ME6012 MAINTENANCE ENGINEERING

OBJECTIVES:

- To enable the student to understand the principles, functions and practices adapted in industry for the successful management of maintenance activities.
- To explain the different maintenance categories like Preventive maintenance, condition monitoring and repair of machine elements.
- To illustrate some of the simple instruments used for condition monitoring in industry.

UNIT I PRINCIPLES AND PRACTICES OF MAINTENANCE PLANNING

UNIT II MAINTENANCE POLICIES – PREVENTIVE MAINTENANCE
Maintenance categories – Comparative merits of each category – Preventive maintenance, maintenance schedules, repair cycle - Principles and methods of lubrication – TPM.

UNIT III CONDITION MONITORING
Condition Monitoring – Cost comparison with and without CM – On-load testing and offload testing – Methods and instruments for CM – Temperature sensitive tapes – Pistol thermometers – wear-debris analysis.

UNIT IV REPAIR METHODS FOR BASIC MACHINE ELEMENTS
Repair methods for beds, slideways, spindles, gears, lead screws and bearings – Failure analysis – Failures and their development – Logical fault location methods – Sequential fault location.

UNIT V REPAIR METHODS FOR MATERIAL HANDLING EQUIPMENT
Repair methods for Material handling equipment - Equipment records – Job order systems - Use of computers in maintenance.

OUTCOMES:

- Upon completion of the programme, the students can able to implement the maintenance function and different practices in industries for the successful management of maintenance activities
- To identify the different maintenance categories like Preventive maintenance, condition monitoring and repair of machine elements.

TEXT BOOKS:
REFERENCES: