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

## SEMESTER I

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#### ELECTIVE – III

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### SEMESTER VIII

#### 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 - 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%

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:

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

OBJECTIVES:
- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.
UNIT I  CRYSTAL PHYSICS  9
Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Diamond and graphite structures (qualitative treatment). Crystal growth techniques – solution, melt (Bridgman and Czochralski) and vapour growth techniques (qualitative).

UNIT II  PROPERTIES OF MATTER AND THERMAL PHYSICS  9

UNIT III  QUANTUM PHYSICS  9

UNIT IV  ACOUSTICS AND ULTRASONICS  9

UNIT V  PHOTONICS AND FIBRE OPTICS  9

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
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  5+9
Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of
ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of
involutes of square and circle – Drawing of tangents and normal to the above curves, Scales:
Construction of Diagonal and Vernier scales.
Visualisation concepts and Free Hand sketching: Visualisation 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, planning 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
5. Measurement of energy using single phase energy meter.

IV ELECTRONICS ENGINEERING PRACTICE
1. Study of Electronic components and equipments – Resistor, colour coding 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:
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:

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.

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 ‘emojis’ 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 – 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 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 parallelepips.

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 T_c 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 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
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:
UNIT II  BIPOLAR JUNCTION  
NPN -PNP -Junctions-Early effect-Current equations – Input and Output characteristics of CE, CB  
CC-Hybrid -τ model - h-parameter model, Ebers Moll Model- Gummel Poon-model, Multi Emitter  
Transistor.

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  
UJT, SCR, Diac, Triac, Power BJT- Power MOSFET- DMOS-VMOS.  LED, LCD, Photo transistor,  
Opto Coupler, Solar cell, CCD.

TOTAL: 45 PERIODS

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  
2007.

REFERENCES:  

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  
Ohm’s Law – Kirchoffs laws – DC and AC Circuits – Resistors in series and parallel circuits – Mesh  
current and node voltage method of analysis for D.C and A.C. circuits – Phasor Diagram – Power,  
Power Factor and Energy
UNIT II  NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS  
Network reduction: voltage and current division, source transformation – star delta conversion. Thevenin’s 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 & 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.

(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 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:

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)

EC6211 CIRCUITS AND DEVICES LABORATORY

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 Clamper & 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

BC 107, BC 148, 2N2646, BFW10 - 25 each
1N4007, Zener diodes - 25 each
Resistors, Capacitors, Inductors - sufficient quantities
Bread Boards - 15 Nos
CRO (30MHz) - 10 Nos.
Function Generators (3MHz) - 10 Nos.
Dual Regulated Power Supplies (0 – 30V) - 10 Nos.
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:
OBJECTIVES:

- To introduce three phase supply and power measurement.
- To understand concepts in electrical generators, motors and transformers.
- To introduce power generation, transmission and distribution concepts.
- To learn basic measurement concepts.
- To learn the concepts of electronic measurements.
- To learn about importance of digital instruments in measurements

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

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

UNIT II INHERITANCE & POLYMORPHISM
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
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

UNIT V  SORTING and SEARCHING  8
Sorting algorithms: Insertion sort - Quick sort - Merge sort - Searching: Linear search –Binary Search

TOTAL: 45 PERIODS

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  L T P C  3 0 0 3

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  9
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

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

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 BJT s and MOSFETs
- Design and construct amplifiers
- Construct amplifiers with active loads
- Study high frequency response of all amplifiers

UNIT I POWER SUPPLIES AND BIASING OF DISCRETE BJT AND MOSFET 9
Rectifiers with filters- 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 JFET 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 frequency and Miller effect, High frequency analysis of CE and MOSFET CS amplifier, Short circuit current gain, cut off frequency – $f_\alpha$ and $f_\beta$ 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:
1. Donald .A. Neamen, Electronic Circuit Analysis and Design –2


REFERENCES:


th Edition, John Willey & Sons 2005


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 Electronic Circuits

LIST OF ANALOG EXPERIMENTS:
1. Half Wave and Full Wave Rectifiers, Filters, Power supplies
2. Frequency Response of CE, CB, CC and CS amplifiers
3. Darlington Amplifier
4. Differential Amplifiers- Transfer characteristic, CMRR Measurement
5. Cascode / Cascade amplifier
6. Class A and Class B Power Amplifiers
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 REQUIREMENTS 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

Equipments for Digital Lab
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

**EC6312**

**OOPS AND DATA STRUCTURES LABORATORY**

**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 L T P C
3 1 0 4

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  L T P C
3 0 0 3

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  9
UNIT II  OSCILLATORS  9

UNIT III  TUNED AMPLIFIERS  9

UNIT IV  WAVE SHAPING AND MULTIVIBRATOR CIRCUITS  9

UNIT V  BLOCKING OSCILLATORS AND TIMEBASE GENERATORS  9

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:
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

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

UNIT II  CONDUCTORS AND DIELECTRICS
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

UNIT IV  MAGNETIC FORCES AND MATERIALS

UNIT V  TIME VARYING FIELDS AND MAXWELL’S EQUATIONS

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

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  L T P C  3 0 0 3

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  
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 feedback amplifiers and oscillators.
- To study the characteristic of source follower
- To understand the concepts of multivibrators

DESIGN AND ANALYSIS OF THE FOLLOWING CIRCUITS
1. Series and Shunt feedback amplifiers-Frequency response, Input and output impedance calculation
2. RC Phase shift oscillator and Wien Bridge Oscillator
3. Hartley Oscillator and Colpitts Oscillator
4. Single Tuned Amplifier
5. RC Integrator and Differentiator circuits
6. Astable and Monostable multivibrators
7. Clippers and Clamps
8. Free running Blocking Oscillators

SIMULATION USING SPICE (Using Transistor):
1. Tuned Collector Oscillator
2. Twin -T Oscillator / Wein Bridge Oscillator
3. Double and Stagger tuned Amplifiers
4. Bistable Multivibrator
5. Schmitt Trigger circuit with Predictable hysteresis
6. Monostable multivibrator with emitter timing and base timing
7. Voltage and Current Time base circuits

TOTAL: 45 PERIODS

OUTCOMES:
On completion of this lab course, the students will be able to
- Analyze various types of feedback amplifiers
- Design oscillators, tuned amplifiers, wave-shaping circuits and multivibrators
- Design and simulate feedback amplifiers, oscillators, tuned amplifiers, wave-shaping circuits and multivibrators using SPICE Tool.

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.
Digital LCR Meter – 2 Nos.
Standalone desktops PC – 15 Nos.
Transistor/FET (BJT-NPN-PNP and NMOS/PMOS) – 50 Nos.
Components and Accessories:
Transistors, Resistors, Capacitors, Inductors, diodes, Zener 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.

TOTAL: 45 PERIODS

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.
- Analyze 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
2. 3HP, 220V, 14A, 750RPM, 0.6A (Shunt field) 1
3. DC Shunt Motor Coupled With Three phase Alternator 1
4. DC Shunt Motor - kW: 5.2 / volts: 220 / Amps: 27.5/ 1
5. Speed: 1500 RPM/ Field current: 0.9A 1
6. Three phase Alternator - kVA: 7.5/ volts: 415/ Amps: 10.4 1
   Speed: 1500 RPM/ Field current: 2A 1
7. Single Phase Transformer; 2 KVA, 230/110-166 V 1
8. Three Phase Induction Motor with Loading Arrangement 1
9. (3.7kW, 415v, 7.5A, 1430 RPM) 1
10. Single Phase Induction Motor with Loading Arrangement 1
11. (230V, 5HP, 17A) 1
12. DC Shunt Motor Coupled With DC Compound Generator 1
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Field current 1.2A) |
| 14. | (DC Compound Generator: kW: 7.5/ volts: 220/ Amps: 38.5/  
Speed: 960 RPM / Field current 1.2A) |
| 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 As per the requirement |
| 30. | Wires As per the requirement |
| 31. | Rheostats(100Ω,1A;250Ω,1.5A;75Ω,16A,1000Ω,1A) Each 2 |
| 32. | Computers with MATLAB or equivalent Software. |

**EC6501**

**DIGITAL COMMUNICATION**

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**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**

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

TOTAL: 45 PERIODS

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

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, BRF) 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:

EC6503  TRANSMISSION LINES AND WAVE GUIDES  L T P C  3 1 0 4

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 TRANSMISSION LINE THEORY
General theory of Transmission lines - the transmission line - general solution - The infinite line - Wavelength, velocity of propagation - Waveform distortion - the distortion-less line - Loading and different methods of loading - Line not terminated in Z0 - Reflection coefficient - calculation of current, voltage, power delivered and efficiency of transmission - Input and transfer impedance - Open and short circuited lines - reflection factor and reflection loss.

UNIT II HIGH FREQUENCY TRANSMISSION LINES
Transmission line equations at radio frequencies - Line of Zero dissipation - Voltage and current on the dissipation-less line, Standing Waves, Nodes, Standing Wave Ratio - Input impedance of the dissipation-less line - Open and short circuited lines - Power and impedance measurement on lines - Reflection losses - Measurement of VSWR and wavelength.

UNIT III IMPEDANCE MATCHING IN HIGH FREQUENCY LINES
Impedance matching: Quarter wave transformer - Impedance matching by stubs - Single stub and double stub matching - Smith chart - Solutions of problems using Smith chart - Single and double stub matching using Smith chart.

UNIT IV PASSIVE FILTERS

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.

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 BOOKS

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 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  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

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:
- 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

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

TOTAL: 45 PERIODS

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

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
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):
1. Kits for Signal Sampling, TDM, AM, FM, PCM, DM and Line Coding Schemes
2. CROs – 15 Nos
3. MATLAB / SCILAB or equivalent software package for simulation experiments
4. PCs - 10 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

Peripheral and Interfacing Experiments
7. Traffic light control
8. Stepper motor control
9. Digital clock
10. Keyboard 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:
- 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:
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:
CS6551 COMPUTER NETWORKS

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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:

EC6601 VLSI DESIGN L T 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 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:

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 frequencies

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

TOTAL: 45 PERIODS

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:

EC6611  COMPUTER NETWORKS LABORATORY

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.

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/ Equivalent

HARDWARE
Standalone desktops

EC6612 VLSI DESIGN LABORATORY

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.

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

GE 6674  COMMUNICATION AND SOFT SKILLS - LABORATORY BASED  L T P C
0 0 4 2

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)

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:

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<tr>
<th>S. No.</th>
<th>Description of Equipment (minimum configuration)</th>
<th>Qty Required</th>
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<tr>
<td>1</td>
<td>Server</td>
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<tr>
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<td>• PIV System</td>
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<td>• 1 GB RAM / 40 GB HDD</td>
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<td>• OS: Win 2000 server</td>
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<td>• Audio card with headphones</td>
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<td>• JRE 1.3</td>
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<td>Client Systems</td>
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<td>• PIII System</td>
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<td>• 256 or 512 MB RAM / 40 GB HDD</td>
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<td>Handicam</td>
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<td>Television 46”</td>
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<td>Collar mike</td>
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<td>Cordless mike</td>
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<td>7</td>
<td>Audio Mixer</td>
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<td>8</td>
<td>DVD recorder/player</td>
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<td>9</td>
<td>LCD Projector with MP3/CD/DVD provision for Audio/video facility</td>
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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

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<tr>
<td>Online Test</td>
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<tr>
<td>Interview</td>
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<tr>
<td>Presentation</td>
<td>15 marks</td>
</tr>
<tr>
<td>Group Discussion</td>
<td>15 marks</td>
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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/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 Magnets, 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:
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

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

EC6712   OPTICAL AND MICROWAVE LABORATORY                  L T P C
                      0 0 3 2

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
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 L T P C 3 0 0 3

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:

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  9

UNIT II  MOBILE NETWORK LAYER  9

UNIT III  MOBILE TRANSPORT LAYER  9

UNIT IV  WIRELESS WIDE AREA NETWORK  9

UNIT V  4G NETWORKS  9

TOTAL: 45 PERIODS

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:
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.

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.

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.

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.

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/.

EC6003  ROBOTICS AND AUTOMATION  L  T  P  C
                                      3  0  0  3

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

TOTAL: 45 PERIODS

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

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)- Worlspace 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, IIDQ 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 SOCs

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:
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.

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:
OBJECTIVES:
The student should be made to:
- Learn the various soft computing frameworks
- 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

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:

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
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.

REFERENCES:  

CS6013 FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT L T P C  
3 0 0 3

OBJECTIVE:  
This program can be offered with all Undergraduate programs/courses for all engineering streams. The FSIPD program aims to improve student’s awareness and understanding of the basic concepts involved in Integrated product Development (IPD) by providing exposure to the key product development concepts. Students, who complete this program, will stand a better chance to be considered for jobs in the Engineering industry.

COURSE OBJECTIVES:  
After completing this program, the student will be able to obtain the technical skills needed to effectively play the entry level design engineer role in an engineering organization.

The student will be able to:  
- Understand the global trends and development methodologies of various types of products and services  
- Conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems  
- Understand requirement engineering and know how to collect, analyze and arrive at
requirements for new product development and convert them in to design specification
- Understand system modeling for system, sub-system and their interfaces and arrive at
  the optimum system specification and characteristics
- Gain knowledge of the Innovation & Product Development process in the Business
  Context

UNIT I  FUNDAMENTALS OF PRODUCT DEVELOPMENT  9
Global Trends Analysis and Product decision - Social Trends - Technical Trends- Economical
Trends - Environmental Trends - Political/Policy Trends - Introduction to Product Development
Methodologies and Management - Overview of Products and Services - Types of Product
Development - Overview of Product Development methodologies - Product Life Cycle -
Product Development Planning and Management

UNIT II  REQUIREMENTS AND SYSTEM DESIGN  9
Requirement Engineering - Types of Requirements - Requirement Engineering - Traceability
Matrix and Analysis - Requirement Management - System Design & Modeling - Introduction
to System Modeling - System Optimization - System Specification - Sub-System Design - Interface
Design

UNIT III  DESIGN AND TESTING  9
Conceptualization - Industrial Design and User Interface Design - Introduction to Concept
generation Techniques – Challenges in Integration of Engineering Disciplines - Concept Screening
& Evaluation - Detailed Design - Component Design and Verification – Mechanical,
Electronics and Software Subsystems - High Level Design/Low Level Design of S/W Program -
Types of Prototypes, S/W Testing- Hardware Schematic, Component design, Layout and Hardware
Testing – Prototyping - Introduction to Rapid Prototyping and Rapid Manufacturing - System
Integration, Testing, Certification and Documentation

UNIT IV  SUSTAINANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT  9
Introduction to Product verification processes and stages - Introduction to Product validation
processes and stages - Product Testing standards and Certification - Product Documentation -
Sustenance - Maintenance and Repair – Enhancements - Product EoL - Obsolescence
Management - Configuration Management - EoL Disposal

UNIT V  BUSINESS DYNAMICS ENGINEERING SERVICES INDUSTRY  9
The Industry - Engineering Services Industry - Product development in Industry versus Academia -
The IPD Essentials - Introduction to vertical specific product development processes -
Manufacturing/Purchase and Assembly of Systems - Integration of Mechanical, Embedded and
S/W systems – Product development Trade-offs - Intellectual Property Rights and Confidentiality -
Security and configuration management.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
The students will be able to
- Define, formulate and analyze a problem
- Solve specific problems independently or as part of a team
- Develop documentation, test specifications and coordinate with various teams to
  validate and sustain up to the EoL (End of Life) support activities for engineering
  customer
- Work independently as well as in teams
- Manage a project from start to finish
COURSE MATERIAL AND PEDAGOGY:
- NASSCOM has agreed to prepare / revise the course materials [selected teachers Anna University from major disciplines will be included in the process] as PPT slides for all the UNITS. The PPTs can be printed and given to each student if necessary at a Nominal Fee. This is the best possible material for this special course.
- NASSCOM will train the teachers of Anna University to enable them to teach this course. A training programme for nearly 3500 teachers needs to be organized. The team is exploring use of technology including the EDUSAT facility at Anna University.
- The course is to be offered as an elective to all UG Students both in the Constituent Colleges and Affiliated colleges of Anna University.

TEXT BOOKS [INDIAN ECONOMY EDITIONS]:

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.

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:

REFERENCES:

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
UNIT II       JAVA NETWORKING FUNDAMENTALS  9

UNIT III     CLIENT SIDE TECHNOLOGIES  9

UNIT IV      SERVER SIDE TECHNOLOGIES  9

UNIT V     APPLICATION DEVELOPMENT ENVIRONMENT  9

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                    L T P C
                           3 0 0 3

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

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

UNIT IV THREAD LEVEL PARALLELISM
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

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
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, hrough-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 freevAlloys, 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.

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 L T P C
3 0 0 3

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.mit.edu](http://www.ocw.mit.edu)  [www.arm.com](http://www.arm.com)

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<th>EC6014</th>
<th>COGNITIVE RADIO</th>
<th>L T P C</th>
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**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

TOTAL:45 PERIODS

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:

EC6016          OPTO ELECTRONIC DEVICES

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.

TOTAL: 45 PERIODS

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:

EC6017  RF SYSTEM DESIGN  
L T P C  
3 0 0 3

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:
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:

GE6082 INDIAN CONSTITUTION AND SOCIETY  L T P C
3 0 0 3

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  L T P C
3 0 0 3

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

GE6083 DISASTER MANAGEMENT L T P C
3 0 0 3

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

UNIT I INTRODUCTION TO DISASTERS 9
Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don’ts during various types of Disasters.
UNIT II  APPROACHES TO DISASTER RISK REDUCTION (DRR)  
Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of-community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

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

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

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

TOTAL: 45 PERIODS

OUTCOMES:
The students will be able to
- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management
TEXTBOOK:

REFERENCES
1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005
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
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
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
Performance metric, Flash architecture, Pipelined Architecture, Successive approximation architecture, Time interleaved architecture.

UNIT V PRECISION TECHNIQUES
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:
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  10

UNIT III   HASH FUNCTIONS AND DIGITAL SIGNATURES  8

UNIT IV   SECURITY PRACTICE & SYSTEM SECURITY  8

UNIT V   E-MAIL, IP & WEB SECURITY  9

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:

GE6757 TOTAL QUALITY MANAGEMENT

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  9

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

TEXTBOOK:

REFERENCES:

MG6071 ENTERPRENEURSHIP DEVELOPMENT  L T P C 3 0 0 3

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  9

UNIT II  MOTIVATION  9
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  9

UNIT IV  FINANCING AND ACCOUNTING  9
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 :  

MG6088  SOFTWARE PROJECT MANAGEMENT  
L T P C  
3 0 0 3

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  9

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:
UNIT V


TOTAL : 45 PERIODS

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

REFERENCES: