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

## SEMESTER I

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OBJECTIVES:

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

UNIT I

9+3
Listening - Introducing learners to GIE - Types of listening - Listening to audio (verbal & sounds); Speaking - Speaking about one's place, important festivals etc. - Introducing oneself, one's family / friend; Reading - Skimming a reading passage - Scanning for specific information - Note-making; Writing - Free writing on any given topic (My favourite place / Hobbies / School life, etc.) - Sentence completion - Autobiographical writing (writing about one's leisure time activities, hometown, etc.); Grammar - Prepositions - Reference words - Wh-questions - Tenses (Simple); Vocabulary - Word formation - Word expansion (root words / etymology); E-materials - Interactive exercises for Grammar & Vocabulary - Reading comprehension exercises - Listening to audio files and answering questions.

UNIT II

9+3
Listening - Listening and responding to video lectures / talks; Speaking - Describing a simple process (filling a form, etc.) - Asking and answering questions - Telephone skills - Telephone etiquette; Reading - Critical reading - Finding key information in a given text - Sifting facts from opinions; Writing - Biographical writing (place, people) - Process descriptions (general/specific) - Definitions - Recommendations - Instructions; Grammar - Use of imperatives - Subject-verb agreement; Vocabulary - Compound words - Word Association (connotation); E-materials - Interactive exercises for Grammar and Vocabulary - Listening exercises with sample telephone conversations / lectures - Picture-based activities.

UNIT III

9+3
Listening - Listening to specific task - focused audio tracks; Speaking - Role-play – Simulation - Group interaction - Speaking in formal situations (teachers, officials, foreigners); Reading - Reading and interpreting visual material; Writing - Jumbled sentences - Coherence and cohesion in writing - Channel conversion (flowchart into process) - Types of paragraph (cause and effect / compare and contrast / narrative / analytical) - Informal writing (letter/e-mail/blogs) - Paraphrasing; Grammar - Tenses (Past) - Use of sequence words - Adjectives; Vocabulary - Different forms and uses of words, Cause and effect words; E-materials - Interactive exercises for Grammar and Vocabulary - Excerpts from films related to the theme and follow up exercises - Pictures of flow charts and tables for interpretations.

UNIT IV

9+3
Listening - Watching videos / documentaries and responding to questions based on them; Speaking - Responding to questions - Different forms of interviews - Speaking at different types of interviews; Reading - Making inference from the reading passage - Predicting the content of a reading passage; Writing - Interpreting visual materials (line graphs, pie charts etc.) - Essay writing – Different types of essays; Grammar - Adverbs – Tenses – future time reference; Vocabulary - Single word substitutes - Use of abbreviations and acronyms; E-materials - Interactive exercises for Grammar and Vocabulary - Sample interviews - film scenes - dialogue writing.
UNIT V

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

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

OUTCOMES:
Learners should be able to:
- Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
- Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
- Read different genres of texts adopting various reading strategies.
- listen/view and comprehend different spoken discourses/excerpts in different accents.

TEXTBOOKS:

REFERENCES:

EXTENSIVE Reading (Not for Examination)

WEBSITES:

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

Internal assessment: 20%
3 tests of which two are pen and paper tests and the other is a combination of different modes of assessment like

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

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

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

End Semester Examination: 80%

MA6151 MATHEMATICS – I

OBJECTIVES:

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

UNIT I MATRICES

9+3

UNIT II SEQUENCES AND SERIES

9+3
UNIT III APPLICATIONS OF DIFFERENTIAL CALCULUS 9+3
Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes - Evolute as envelope of normals.

UNIT IV DIFFERENTIAL CALCULUS OF SEVERAL VARIABLES 9+3

UNIT V MULTIPLE INTEGRALS 9+3

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

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

TEXT BOOKS:

REFERENCES:

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

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

UNIT I CRYSTAL PHYSICS 9
Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Diamond and graphite structures (qualitative treatment)-Crystal growth techniques –solution, melt (Bridgman and Czochralski) and vapour growth techniques (qualitative)
UNIT II PROPERTIES OF MATTER AND THERMAL PHYSICS
Elasticity - Hooke’s law - Relationship between three modulii of elasticity (qualitative) – stress-strain diagram – Poisson’s ratio – Factors affecting elasticity – Bending moment – Depression of a cantilever – Young’s modulus by uniform bending - I-shaped girders

UNIT III QUANTUM PHYSICS

UNIT IV ACOUSTICS AND ULTRASONICS
Production of ultrasonics by magnetostriction and piezoelectric methods - acoustic grating - Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C – scan displays, Medical applications - Sonogram

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

TOTAL: 45 PERIODS
OUTCOMES:
The students will have knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications

TEXT BOOKS:

REFERENCES:
1. Searls and Zemansky. University Physics, 2009
OBJECTIVES:
- To make the students conversant with basics of polymer chemistry.
- To make the student acquire sound knowledge of second law of thermodynamics and second law based derivations of importance in engineering applications in all disciplines.
- To acquaint the student with concepts of important photophysical and photochemical processes and spectroscopy.
- To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.
- To acquaint the students with the basics of nano materials, their properties and applications.

UNIT I  POLYMER CHEMISTRY  
Introduction: Classification of polymers – Natural and synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerization. Types and mechanism of polymerization: Addition (Free Radical, cationic and anionic); condensation and copolymerization. Properties of polymers: Tg, Tacticity, Molecular weight – weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension. Preparation, properties and uses of Nylon 6,6, and Epoxy resin.

UNIT II  CHEMICAL THERMODYNAMICS  
Terminology of thermodynamics - Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Helmholtz and Gibbs free energy functions (problems); Criteria of spontaneity; Gibbs-Helmholtz equation (problems); Clausius-Clapeyron equation; Maxwell relations – Van’t Hoff isotherm and isochore(problems).

UNIT III  PHOTOCHEMISTRY AND SPECTROSCOPY  

UNIT IV  PHASE RULE AND ALLOYS  

UNIT V  NANO CHEMISTRY  
Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. nanoparticles: nano cluster, nano rod, nanotube(CNT) and nanowire. Synthesis: precipitation, thermolysis, hydrothermal, solvothermal, electrodeposition, chemical vapour deposition, laser ablation; Properties and applications
OUTCOMES:
- The knowledge gained on polymer chemistry, thermodynamics, spectroscopy, phase rule and nano materials will provide a strong platform to understand the concepts on these subjects for further learning.

TEXT BOOKS:

REFERENCES:

GE6151 COMPUTER PROGRAMMING L T P C
3 0 0 3

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

UNIT I INTRODUCTION

UNIT II C PROGRAMMING BASICS

UNIT III ARRAYS AND STRINGS

UNIT IV FUNCTIONS AND POINTERS
UNIT V STRUCTURES AND UNIONS

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

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

TEXT BOOKS:

REFERENCES:

GE6152 ENGINEERING GRAPHICS

OBJECTIVES:
- To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products
- To expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (Not for Examination)
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HAND SKETCHING
Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES
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 EQUIPMENTS FOR A BATCH OF 30 STUDENTS:
Standalone desktops with C compiler 30 Nos.
(or)
Server with C compiler supporting 30 terminals or more.

GE6162 ENGINEERING PRACTICES LABORATORY

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

**GROUP A (CIVIL & MECHANICAL)**

I  CIVIL ENGINEERING PRACTICE

**Buildings:**
(a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

**Plumbing Works:**
(a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
(b) Study of pipe connections requirements for pumps and turbines.
(c) Preparation of plumbing line sketches for water supply and sewage works.
(d) Hands-on-exercise:

Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
(e) Demonstration of plumbing requirements of high-rise buildings.

**Carpentry using Power Tools only:**
(a) Study of the joints in roofs, doors, windows and furniture.
(b) Hands-on-exercise:

Wood work, joints by sawing, planing and cutting.

II  MECHANICAL ENGINEERING PRACTICE

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

**Basic Machining:**
(a) Simple Turning and Taper turning
(b) Drilling Practice

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

**Machine assembly practice:**
(a) Study of centrifugal pump
(b) Study of air conditioner

**Demonstration on:**
(a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
(b) Foundry operations like mould preparation for gear and step cone pulley.
(c) Fitting – Exercises – Preparation of square fitting and vee – fitting models.
III ELECTRICAL ENGINEERING PRACTICE
1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
5. Measurement of energy using single phase energy meter.

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

TOTAL: 45 PERIODS

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

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

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

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

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

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

REFERENCES:

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

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

LIST OF EXPERIMENTS
(Any FIVE Experiments)
1. (a) Determination of Wavelength, and particle size using Laser
    (b) Determination of acceptance angle in an optical fiber.
2. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
3. Determination of wavelength of mercury spectrum – spectrometer grating
5. Determination of Young’s modulus by Non uniform bending method
6. Determination of specific resistance of a given coil of wire – Carey Foster’s Bridge

OUTCOMES:
The hands on exercises undergone by the students will help them to apply physics principles of optics and thermal physics to evaluate engineering properties of materials.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
1. Diode laser, lycopodium powder, glass plate, optical fiber.
2. Ultrasonic interferometer
3. Spectrometer, mercury lamp, grating
4. Lee’s Disc experimental set up
5. Traveling microscope, meter scale, knife edge, weights
6. Carey foster’s bridge set up  
   (vernier Caliper, Screw gauge, reading lens are required for most of the experiments)

**CHEMISTRY LABORATORY-I**

**LIST OF EXPERIMENTS**
(Any FIVE Experiments)

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

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

**OBJECTIVES:**
- To make learners acquire listening and speaking skills in both formal and informal contexts.
- To help them develop their reading skills by familiarizing them with different types of reading strategies.
- To equip them with writing skills needed for academic as well as workplace contexts.
• To make them acquire language skills at their own pace by using e-materials and language lab components.

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

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

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

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

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

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

TEXT BOOKS

REFERENCES

EXTENSIVE Reading (Not for Examination)

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

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

Internal assessment: 20%
3 tests of which two are pen and paper tests and the other is a combination of different modes of assessment like
- Project
- Assignment
- Report
- Creative writing, etc.

All the four skills are to be tested with equal weightage given to each.
- Speaking assessment: Individual presentations, Group discussions
- Reading assessment: Reading passages with comprehension questions graded following Bloom’s taxonomy
- Writing assessment: Writing essays, CVs, reports etc. Writing should include grammar and vocabulary.
- Listening/Viewing assessment: Lectures, dialogues, film clippings with questions on verbal as well as audio/visual content graded following Bloom’s taxonomy.

End Semester Examination: 80%

MA6251 MATHEMATICS – II
L T P C
3 1 0 4

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

UNIT I VECTOR CALCULUS
Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green’s theorem in a plane, Gauss divergence theorem and Stokes’ theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.

UNIT II ORDINARY DIFFERENTIAL EQUATIONS
Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy’s and Legendre’s linear equations – Simultaneous first order linear equations with constant coefficients.
UNIT III    LAPLACE TRANSFORM  

UNIT IV    ANALYTIC FUNCTIONS  
Functions of a complex variable – Analytic functions: Necessary conditions – Cauchy-Riemann equations and sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping: w = z+k, kz, 1/z, z², e^z and bilinear transformation.

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

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

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

TEXT BOOKS:

REFERENCES:

PH6251   ENGINEERING PHYSICS – II  
L T P C  
3 0 0 3  

OBJECTIVES:
• To enrich the understanding of various types of materials and their applications in engineering and technology.
UNIT I CONDUCTING MATERIALS

UNIT II SEMICONDUCTING MATERIALS

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS
Superconductivity : properties – Type I and Type II superconductors – BCS theory of superconductivity(Qualitative) - High $T_c$ 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:
OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- Principles of electrochemical reactions, redox reactions in corrosion of materials and methods for corrosion prevention and protection of materials.
- Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.
- Preparation, properties and applications of engineering materials.

Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels.

UNIT I WATER TECHNOLOGY

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

UNIT II ELECTROCHEMISTRY AND CORROSION


UNIT III ENERGY SOURCES


UNIT IV ENGINEERING MATERIALS

- Abrasives: definition, classification or types, grinding wheel, abrasive paper and cloth. Refractories: definition, characteristics, classification, properties – 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:

EC6202 ELECTRONIC DEVICES AND CIRCUITS

OBJECTIVES:
The student should be made to:
- Be familiar with the structure of basic electronic devices.
- Be exposed to the operation and applications of electronic devices

UNIT I PN JUNCTION DEVICES
PN junction diode – structure, operation and V-I characteristics, diffusion and transient capacitance - Rectifiers – Half Wave and Full Wave Rectifier,– Display devices- LED, Laser diodes, Zener diode-characteristics-Zener Reverse characteristics – Zener as regulator

UNIT II TRANSISTORS
BJT, JFET, MOSFET- structure, operation, characteristics and Biasing UJT, Thyristor and IGBT - Structure and characteristics.

UNIT III AMPLIFIERS
BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response – MOSFET small signal model- Analysis of CS and Source follower – Gain and frequency response- High frequency analysis.

UNIT IV MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER
BIMOS cascade amplifier, Differential amplifier – Common mode and Difference mode analysis – FET input stages – Single tuned amplifiers – Gain and frequency response – Neutralization methods, power amplifiers –Types (Qualitative analysis).

UNIT V FEEDBACK AMPLIFIERS AND OSCILLATORS

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

OUTCOMES:
Upon Completion of the course, the students will be able to:
- Explain the structure of basic electronic devices.
- Design applications using basic electronic devices
TEXT BOOKS:

REFERENCES:

EE6201 CIRCUIT THEORY

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

UNIT I BASIC CIRCUITS ANALYSIS

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

UNIT III RESONANCE AND COUPLED CIRCUITS

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

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

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

TOTAL: 60 PERIODS
TEXT BOOKS:

REFERENCES:

GE6262 PHYSICS AND CHEMISTRY LABORATORY – II

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

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

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

UNIT IV  FOURIER TRANSFORMS  9+3

UNIT V  Z - TRANSFORMS AND DIFFERENCE EQUATIONS  9+3

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

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

TEXT BOOKS:

REFERENCES:

OBJECTIVES:
The student should be made to:
• Learn the working of human body starting from Cells.
• Understand the working of Cardiac Systems and Nervous Systems.
• Know about the function of Human Digestive Systems
• Learn about the working of Human Special Senses.
UNIT I
INTRODUCTION

UNIT II
CARDIAC AND NERVOUS SYSTEM

UNIT III
RESPIRATORY SYSTEM

UNIT IV
DIGESTIVE AND EXCRETORY SYSTEM

UNIT V
SPECIAL SENSES

OUTCOMES:
At the end of the course, the student should be able to:
- Analyze the structure of the cell
- Explain the functioning of human body.
- Discuss the Anatomy and Physiological aspects of respiratory systems.

TEXT BOOK:

REFERENCES:

MD6302
MEASUREMENTS AND INSTRUMENTATION
OBJECTIVES:
The student should be made to:
- Learn the basics of Measurement Systems and
- Analyze the Characteristics of Instruments
- Understand about RLC measurements using bridge circuits
- Know the relevance of digital instruments in measurements and need for data acquisition systems
UNIT I  BASICS OF MEASUREMENT SYSTEMS AND INSTRUMENTS

Measurements – Introduction, Significance and Methods of measurements, Instruments - Electronic instruments and its classification, Deflection and Null type instruments, Comparison of Analog and Digital Modes of operation, Application of measurement system, Errors – Introduction and its types, Accuracy and Precision, Noise, Resolution, loading effects, Units, Absolute units - Fundamental and Derived units.

UNIT II  ELECTROMECHANICAL INDICATING INSTRUMENTS


UNIT III  BRIDGE CIRCUITS FOR RLC MEASUREMENTS


UNIT IV  ELECTRONIC INSTRUMENTS


UNIT V  TRANSDUCERS AND DATA ACQUISITION SYSTEM

Principles of operation, Classification of transducers based upon principle of transduction, Summary of factors influencing the choice of transducer, Qualitative treatment of Strain Gauge, LVDT, Thermocouple, Piezo-electric crystal and Photoelectric transducers. Analog and digital data acquisition system, Methods of data transmission, Virtual Instrumentation.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain the function of bridge circuits for RLC measurements
- Analyze the functions of different electronic instruments
- Select right kind of transducers for specific application
- Design Data Acquisition system.

TEXT BOOKS:


REFERENCES:

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  9+3
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  9+3
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  9+3
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  9+3
Baseband Sampling - DTFT – Properties of DTFT - Z Transform – Properties of Z Transform

UNIT V  
LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS  9+3
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:
OBJECTIVES:
The student should be made to:
- Understand Boolean algebra
- Be familiar with the electronic circuits involved in the making of logic gates
- Be exposed to semiconductor memories and related technology

UNIT I BASIC CONCEPTS AND COMBINATIONAL CIRCUITS
Number Systems – Decimal, Binary, Octal, Hexadecimal, 1s and 2s complements, Codes – Binary, BCD, 84-2-1, 2421, Excess 3, Biquinary, Gray, Alphanumeric codes, Boolean theorems, Logic gates, Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map and Tabulation methods, Problem formulation and design of combinational circuits, Code-Converters

UNIT II MSI CIRCUITS
Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder, Carry Look Ahead Adder, BCD Adder, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Mux/Demux, Implementation of combinational logic using standard ICs, ROM, EPROM and EEPROM, PLA and PAL

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS
Flip flops – SR, JK, T, D, Master/Slave FF, Triggering of FFS, Analysis and design of clocked sequential circuits – Moore / Mealy models, state minimization, state assignment, circuit implementation, Counters, Ripple Counters, Ring Counters, Shift registers, Universal Shift Register.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS
Stable and Unstable states, output specifications, cycles and races, state reduction, race free assignments, Hazards, Essential Hazards, Pulse mode sequential circuits, Design of Hazard free circuits

UNIT V LOGIC FAMILIES AND SEMICONDUCTOR MEMORIES
Logic families- TTL, MOS, CMOS, Comparison of Logic families, Basic memory cell, RAM, Memory decoding, Static and Dynamic memories.

TOTAL : 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to
- Apply Boolean Algebra in Digital Systems
- Design the Combinational digital circuits
- Design the synchronous and Asynchronous Sequential Circuits

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
The student should be made to:
- Learn different methods of biasing transistors.
- Design of signal generation circuits.
- Design of amplifier circuits with feedback.
- Design of power supplies.

UNIT I  DIODE APPLICATIONS AND TRANSISTOR BIASING

UNIT II  SMALL SIGNAL AMPLIFIERS
Two port network, h-parameter model – small signal analysis of BJT (CE and CC configurations only) – high frequency model of BJT – (CE configuration only) – small signal analysis of JFET (CS configuration only) - Frequency response of BJT and FET.

UNIT III  FEEDBACK AMPLIFIER AND OSCILLATORS
Basic of feedback system (block diagram approach) – Types of feedback amplifier – Basic principles of oscillator. Audio oscillators – RC phase shift and wein bridge oscillator. RF oscillators – Heartly and Collpit oscillator – Crystal oscillator, Multivibrators.

UNIT IV  POWER AMPLIFIERS AND TUNED AMPLIFIERS

UNIT V  VOLTAGE REGULATORS
Shunt voltage regulator – Series voltage regulator – current limiting – feedback technique– SMPS (Block diagram approach) – DC to DC converter - Three terminal IC regulators (78XX and 79XX).

OUTCOMES:
Upon Completion of the course, the students will be able to:
- Design circuits with transistor biasing
- Design amplifier circuits
- Design power supplies

TEXT BOOK:

REFERENCES:
OBJECTIVES:
To develop an understanding of transducers, data acquisition, data conversion the methods used for measuring physical parameters.

LIST OF EXPERIMENTS:
1. Study of displacement and pressure transducer.
2. Static characteristic of LVDT and null voltage compensation.
3. Calibration of Strain Gauge type force and torque transducers.
4. Calibration of magnetic and photoelectric type velocity transducers.
5. Design of cold junction compensation for Thermocouples.
6. Static and Dynamic characteristics of RTD and lead wire compensations.
7. Static characteristic of Thermistor and its linearization
8. Study of Capacitive transducer.
10. Dynamic characteristics of various types of Thermocouple with and without thermo wells.
11. Schering Bridge for capacitance measurement and Anderson Bridge for inductance measurement.
12. Calibration of Voltmeter and Ammeter using potentiometer
13. Wheatstone and Kelvin’s bridge for measurement of resistance
14. Instrumentation amplifiers
15. A/D converters
16. D/A converters
17. Design of signal conditioning circuits and PC interfacing.

TOTAL: 45 PERIODS

LABORATORY REQUIREMENTS:

LAB Requirements.
Study of displacement and pressure transducer.
- Potentiometer – Linear displacement transducer kit 1 No
- Pressure transducer kit 1 No
- Regulated power supply 1 No
- FET voltmeter, ordinary voltmeter 1 No

Static characteristic of LVDT and null voltage compensation.
- LVDT trainer kit 1 No.
- Power supply 1 No.
- Multimeter 1 No.

Calibration of Strain Gauge type force and torque transducers.
- Strain gauge transducer kit for force measurement 1 No
- Strain gauge transducer kit for torque measurements 1 No
- Strain gauge torsion meter 1 No
- Dead weight 1 No
- Variable power supply 1 No
- Loads for measurement A set
- Calibration related accessories

Calibration of magnetic and photoelectric type velocity transducers
- Magnetic type velocity transducer kit 1 No.
- Photoelectric type velocity transducer kit 1 No.
- Power supply
- Multimeter
- Calibration related accessories
Design of cold junction compensation for Thermocouples.
Thermocouples transducer 1 No.
Resistors
Power supply 1 No.
Bread Board 1 No.
Multimeter 1 No.

Static and Dynamic characteristics of RTD and lead wire compensations.
RTD trainer kit 1 No.
RTD 1 No.
Heater 1 No.
Thermometer 1 No.
Multimeter 1 No.

Static characteristic of Thermistor and its linearization
Thermistor Trainer kit 1 No.
Heater 1 No.
Thermistor 1 No.
Thermometer 1 No.
Voltmeter 1 No.

Study of Capacitive transducer.
Capacitive transducer trainer kit 1 No.
Power Supply 1 No.
Multimeter 1 No.

Calibration of vibration sensor
Vibration sensor trainer kit 1 No.
Power Supply 1 No.
Multimeter 1 No.

Dynamic characteristics of various types of Thermocouple with and without thermo wells.
Thermocouple trainer kit 1 No.
Thermocouple 1 No.
Heater 1 No.
Blower 1 No.
Thermometer 1 No.
Voltmeter 1 No.
Thermowell 1 No.

Schering Bridge for capacitance measurement and Anderson Bridge for inductance measurement.
Resistors Some set
Capacitance Some set
Decade Resistance box 1 No.
Decade Capacitance Box 1 No.
Decade Inductance box 1 No.
Regulated Power Supply 1 No.
CRO 1 No.
Bread Board 1 No.
Function Generator 1 No.

Calibration of Voltmeter and Ammeter using potentiometer
Standard Ammeter 1 No.
Ammeter 1 No.
Variable resistive load 1 No.
RPS 1 No.
Standard Voltmeter 1 No.
Voltmeter 1 No.
Auto transformer 1 No.

**Wheatstone and Kelvin’s bridge for measurement of resistance**
Resistors 1 No.
Galvanometer 1 No.
Regulated Power Supply 1 No.
Bread Board 1 No.
Decade Resistance Box 1 No.
Multimeter 1 No.
Unknown resistance 1 No.

**Instrumentation amplifiers**
A/D converters
A/D converter ICs – 1 No
Function Generator -1 no
RPS 1 No.
CRO 1 No.

**D/A converters**
D/A converter ICs – 1 No
Function Generator -1 no
RPS 1 No.
CRO 1 No.

**Design of signal conditioning circuits and PC interfacing.**
PC and related accessories, Bread board, Function Generator, RPS, R,L,C, components few sets

**OUTCOMES:**
At the end of the laboratory course, the student should be able to:
- Design bridge circuits to measure RLC.
- Analyze the functions of different electronic instruments
- Select right kind of transducers for specific application
- Design Data Acquisition system.

**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. Cascade / 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.

**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
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
OBJECTIVES:
- To introduce the basic building blocks of linear integrated circuits.
- To teach the linear and non-linear applications of operational amplifiers.
- To introduce the theory and applications of analog multipliers and PLL.
- To teach 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.

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:

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

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

UNIT I DATA ABSTRACTION & OVERLOADING
Overview of C++ – Structures – Class Scope and Accessing Class Members – Reference Variables –
Initialization – Constructors – Destructors – Member Functions and Classes – Friend Function –
Dynamic Memory Allocation – Static Class Members – Container Classes and Integrators – Proxy
Classes – Overloading: Function overloading and Operator 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
Trees – Binary Trees – Binary tree representation and traversals – Application of trees: Set
representation and Union-Find operations – Graph and its representations – Graph Traversals –

UNIT V SORTING AND SEARCHING
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:

BM6504 BIOMEDICAL INSTRUMENTATION
L   T   P   C
3   0   0   3

OBJECTIVES:
  • The students will be exposed to electrical and non-electrical physiological measurements and bioamplifiers.

UNIT I BIO POTENTIAL ELECTRODES

UNIT II ELECTRODE CONFIGURATIONS
Biosignals characteristics – frequency and amplitude ranges. ECG – Einthoven’s triangle, standard 12 lead system. EEG – 10-20 electrode system, unipolar, bipolar and average mode. EMG– unipolar and bipolar mode.

UNIT III BIO AMPLIFIER

UNIT IV MEASUREMENT OF NON-ELECTRICAL PARAMETERS
UNIT V BIO-CHEMICAL MEASUREMENT

Biochemical sensors - pH, pO2 and pCO2, Ion selective Field effect Transistor (ISFET), Immunologically sensitive FET (IMFET), Blood glucose sensors - Blood gas analyzers, colorimeter, flame photometer, spectrophotometer, blood cell counter, auto analyzer (simplified schematic description).

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• Perform electrical and non-electrical physiological measurements
• Explain the function of bio amplifiers.

TEXT BOOKS:

REFERENCES:

EC6405 CONTROL SYSTEM ENGINEERING

OBJECTIVES:
• To introduce the elements of control system and their modeling using various Techniques.
• To introduce methods for analyzing the time response, the frequency response and the stability of systems
• To introduce the state variable analysis method

UNIT I CONTROL SYSTEM MODELING
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
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
UNIT IV   STABILITY ANALYSIS

UNIT V   STATE VARIABLE ANALYSIS

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.

TEXT BOOK:

REFERENCES:

GE6351   ENVIRONMENTAL SCIENCE AND ENGINEERING

OBJECTIVES:
To the study of nature and the facts about environment.
• To find and implement scientific, technological, economic and political solutions to environmental problems.
• To study the interrelationship between living organism and environment.
• To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
• To study the dynamic processes and understand the features of the earth’s interior and surface.
• To study the integrated themes and biodiversity, natural resources, pollution control and waste management.
UNIT I  ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY
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 desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Introduction to Environmental Biochemistry: Proteins –Biochemical degradation of pollutants, Bioconversion of pollutants.
Field study of local area to document environmental assets – river/forest/grassland/hill/mountain.

UNIT IV  SOCIAL ISSUES AND THE ENVIRONMENT
7
UNIT V  HUMAN POPULATION AND THE ENVIRONMENT


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:

MD6411  MICROPROCESSOR AND MICROCONTROLLER LABORATORY

OBJECTIVES:
The student should be made to:

- Introduce ALP concepts and features
- Write ALP for arithmetic and logical operations in 8086 and 8051
- Differentiate Serial and Parallel Interface
- Interface different I/Os with Microprocessors
- Be familiar with MASM

LIST OF EXPERIMENTS:

8086 Programs using kits and MASM
1. Basic arithmetic and Logical operations
2. Move a data block without overlap
3. Code conversion, decimal arithmetic and Matrix operations.
4. Floating point operations, string manipulations, sorting and searching
5. Password checking, Print RAM size and system date
6. Counters and Time Delay
Peripherals and Interfacing Experiments
7. Traffic light control
8. Stepper motor control
9. Digital clock
10. 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 EQUIPMENTS 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

MD6412 LINEAR INTEGRATED CIRCUITS LABORATORY

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 SPICE 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 EQUIPMENTS 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 converters, LEDs


MD6413 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))
10. Queue ADT – Array and linked list implementations
11. Search Tree ADT - Binary Search Tree
12. 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 EQUIPMENTS FOR A BATCH OF 30 STUDENTS:
Standalone desktops with C++ Compiler - 30 Nos.
(or)
Server with C++ compiler supporting 30 terminals or more.

MD6501 HOSPITAL MANAGEMENT L T P C 3 0 0 3

OBJECTIVE:
The student should be made to:
Understand the principles, practices and areas of application in Hospital management.

UNIT I OVERVIEW OF HOSPITAL ADMINISTRATION Distinction between Hospital and Industry, Challenges in Hospital Administration – Hospital Planning – Equipment Planning – Functional Planning - Current Issues in Hospital Management - Telemedicine - Bio-Medical Waste Management
UNIT II  HUMAN RESOURCE MANAGEMENT ON HOSPITAL  9

UNIT III  MARKETING RESEARCH & CONSUMER BEHAVIOUR  10
Marketing information systems - assessing information needs, developing & disseminating information - Market Research process - Other market research considerations – Consumer Markets & Consumer Buyer Behaviour - Model of consumer behaviour - Types of buying decision behaviour - The buyer decision process - Model of business buyer behaviour – Major types of buying situations - global marketing in the medical sector - WTO and its implications

UNIT IV  HOSPITAL INFORMATION SYSTEMS & SUPPORTIVE SERVICES  10

UNIT V  QUALITY AND SAFETY ASPECTS IN HOSPITAL  9

TOTAL: 45 PERIODS

OUTCOME:
At the end of the course, the student should be able to:
• Explain the principles, practices and areas of application in Hospital Management.

TEXT BOOKS:

REFERENCES:
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:
OBJECTIVES:
The student should be made to:
- Be exposed to principles of mechanics.
- Learn the mechanics of physiological systems.
- Be familiar with the mathematical models used in the analysis of biomechanical systems.

UNIT I  INTRODUCTION TO MECHANICS

UNIT II  BIOFLUID MECHANICS
Introduction, viscosity and capillary viscometer, Rheological properties of blood, laminar flow, Couette flow and Hagen-poiseuille equation, turbulent flow. Cardiovascular system - biological and mechanical valves development, artificial heart valves testing of valves, Structure, functions, material properties and modeling of Blood vessels.

UNIT III  BIOSOLID MECHANICS
Hard Tissues: Bone structure & composition mechanical properties of bone, cortical and cancellous bones, viscoelastic properties, Maxwell & Voight models – anisotropy.

UNIT IV  BIOMECHANICS OF JOINTS AND IMPLANTS
Skeletal joints, forces and stresses in human joints, Analysis of rigid bodies in equilibrium, free body diagrams, types of joint, biomechanical analysis of elbow, shoulder, spinal column, hip knee and ankle. Design of orthopedic implant, specifications for a prosthetic joint, biocompatibility, requirement of a biomaterial, characteristics of different types of biomaterials, manufacturing process of implants, fixation of implants.

UNIT V  MODELLING AND ERGONOMICS

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Explain the mechanics of physiological systems.
- Analyze the biomechanical systems.
- Design orthopaedic applications.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
The student should be made to:
- Understand internet concepts,
- Learn client and server programming.
- Understand the essentials of Java for developing internet applications

UNIT I  BASIC NETWORK AND WEB CONCEPTS  8
Internet standards-TCP and UDP protocols-URLs-MIME-CGI- Internet applications: FTP, Telnet, Email, Chat. World Wide Web: Overview of HTTP, HTTP request-response, generation of dynamic web pages, cookies

UNIT II  CLIENT SIDE PROGRAMMING  8

UNIT III  DYNAMIC HTML  8
Dynamic HTML-introduction-object model and collections-event model- Cascading Style Sheet (CSS): the need for CSS, introduction to CSS, basic syntax and structure, using CSS, manipulating text, padding, lists, Positioning using CSS.

UNIT IV  JAVA PROGRAMMING  12

UNIT V  SERVER SIDE PROGRAMMING  9

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to
- Explain basic concepts of internet
- Discuss the need for client and server side programming
- Write Java programs
- Develop internet applications using Java.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
The student should be made to:
- Learn ICT applications in medicine with an introduction to health informatics.
- Understand the theories and practices adopted in Hospital Information Systems in the light of medical standards, medical data formats and recent trends in Hospital Information Systems.

UNIT I  MEDICAL INFORMATICS
Introduction – Medical Informatics – Bioinformatics – Health Informatics – Structure of Medical Informatics – Functional capabilities of Hospital Information System – On-line services and Off – line services – Dialogue with the computer.

UNIT II  MEDICAL STANDARDS

UNIT III  MEDICAL DATA STORAGE AND AUTOMATION
Representation of Data, Data modeling Techniques, Relational Hierarchical and network Approach, Normalization techniques for Data handling - Plug-in Data Acquisition and Control Boards – Data Acquisition using Serial Interface – Medical Data formats – Signal, Image and Video Formats – Medical Databases - Automation in clinical laboratories - Intelligent Laboratory Information System – PACS.

UNIT IV  HEALTH INFORMATICS
Bioinformatics Databases, Bio-information technologies, Semantic web and Bioinformatics, Genome projects, Clinical informatics, Nursing informatics, Public health informatics, Education and Training

UNIT V  RECENT TRENDS IN MEDICAL INFORMATICS

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Discuss about health informatics and different ICT applications in medicine.
- Explain the function of Hospital Information Systems
- Analyze medical standards

TEXT BOOKS:

REFERENCES:
OBJECTIVES
The student should be made to:
• Learn characteristics and classification of Biomaterials.
• Understand different metals and ceramics used as biomaterials.
• Learn polymeric materials and combinations that could be used as a tissue replacement implants.
• Know artificial organ developed using these materials.

UNIT I   STRUCTURE OF BIO-MATERIALS AND BIO-COMPATIBILITY 9
Definition and classification of bio-materials, mechanical properties, visco elasticity, wound healing process, body response to implants, blood compatibility.

UNIT II   IMPLANT MATERIALS 9
Metallic implant materials, stainless steels, co-based alloys, Ti-based alloys, ceramic implant materials, aluminum oxides, hydroxyapatite, glass ceramics, carbons, medical applications.

UNIT III   POLYMERIC IMPLANT MATERIALS 9

UNIT IV   TISSUE REPLACEMENT IMPLANTS 9
Small intestinal submucosa and other decellularized matrix biomaterials for tissue repair. Softtissue replacements, sutures, surgical tapes, adhesive, Percutaneous and skin implants, maxillofacial augmentation, Vascular grafts, hard tissue replacement Implants, joint replacements, Pancreas replacement.

UNIT V   ARTIFICIAL ORGANS 9
Artificial blood, Artificial skin, Artificial Heart, Prosthetic Cardiac Valves, Artificial lung (oxygenator), Artificial Kidney (Dialyser membrane), Dental Implants.

OUTCOMES:
At the end of the course, the student should be able to:
• Analyze different types of Biomaterials and its classification.
• Perform combinations of materials that could be used as a tissue replacement implant.

TEXT BOOK:

REFERENCES:
OBJECTIVES:
To enable learners to,
- Develop their communicative competence in English with specific reference to speaking and listening
- Enhance their ability to communicate effectively in interviews.
- Strengthen their prospects of success in competitive examinations.

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

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

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

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

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

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

Lab Infrastructure:

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<th>S. No.</th>
<th>Description of Equipment (minimum configuration)</th>
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<td>Audio Mixer</td>
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<td>8</td>
<td>DVD recorder/player</td>
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<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**

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

**Note on Internal and External Evaluation:**

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

**OUTCOMES:**

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

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

**REFERENCES:**

2. Graded Examinations in Spoken English and Spoken English for Work downloadable materials from Trinity College, London.
4. Interactive Multimedia Programs on Managing Time and Stress.
Web Sources:
http://www.slideshare.net/rohitjsh/presentation-on-group-discussion
http://www.washington.edu/doit/TeamN/present_tips.html
http://www.oxforddictionaries.com/words/writing-job-applications
http://www.kent.ac.uk/careers/cv/coveringletters.htm
http://www.mindtools.com/pages/article/newCDV_34.htm

MD6511 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 EQUIPMENTS 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

MD6512 BIO MEDICAL INSTRUMENTATION LABORATORY

OBJECTIVES:
• To provide hands on training on Measurement of physiological parameters, biochemical parameters measurement and biosignal analysis.

LIST OF EXPERIMENTS:
1. Design and analysis of biological pre amplifiers
2. Recording of ECG signal and analysis
3. Recording of EMG-Signal
4. Recording of EEG-Signal
5. Recording of various physiological parameters using patient monitoring system and telemetry units.
7. Measurement and recording of peripheral blood flow
9. Study of characteristics of optical Isolation amplifier
10. Galvanic skin resistance (GSR) measurement

TOTAL: 45 PERIODS

LAB REQUIREMENTS:
• Multiparameter patient monitoring system : 1 No.
• EEG recorder with accessories for evoked studies: 1 No.
• ECG recorder : 1 No.
• EMG recorder : 1 No.
• pH meter, conductivity meter : 1 No.
• Blood flow measurement system using ultrasound transducer: 1 No.
• GSR measurement setup. : 1 No.
• Function Generators
• DSOs
• Regulated Power supplies
• Bread boards
• IC 741

OUTCOMES:
Student is able to:
• Design the amplifier for Bio signal measurements
• Recording and analysis of bio signals
OBJECTIVES:
The student should be made to:

- Learn digital image fundamentals.
- Be exposed to simple image processing techniques.
- Be familiar with image compression and segmentation techniques.
- Learn to represent image in form of features.

UNIT I  DIGITAL IMAGE FUNDAMENTALS  8

UNIT II  IMAGE ENHANCEMENT  10

UNIT III  IMAGE RESTORATION AND SEGMENTATION  9

UNIT IV  WAVELETS AND IMAGE COMPRESSION  9

UNIT V  IMAGE REPRESENTATION AND RECOGNITION  9

TOTAL: 45 PERIODS

OUTCOMES:
Upon successful completion of this course, students will be able to:

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

TEXT BOOK:

REFERENCES:
OBJECTIVES:
The objective of this to know the principle, design and application of various human assist devices and aids. Additionally, a brief introduction to design aspects of prosthetic and orthotic devices will be given.

UNIT I  CARDIAC ASSIST DEVICES
Synchronous counter pulsation, assisted through respiration right ventricular by-pass pump, left ventricular bypass pump, open chest and closed chest type, Principle and problems--Intra Aortic balloon pumping, Veno Arterial Pumping, Prosthetic Cardio Valves, Biomaterials for purposes, its characteristics and testing.

UNIT II  PROSTHETIC AND ORTHODIC DEVICES

UNIT III  VISUAL AIDS
Ultra sonic and laser canes, Intra ocular lens, Braille Reader, Tactile devices for visually Challenged, Text voice converter, Screen readers.

UNIT IV  HEARING AND SPEECH AIDS
Audiograms, types of deafness - conductive and nervous, hearing aids- Types, constructional and functional characteristics. Cochlear implants- Need, constructional details, speech trainer.

UNIT V  REHABILITATION MEDICINE AND ADVOCACY
Physiological aspects of Function recovery. Psychological aspects of Rehabilitation therapy, Legal aspect available in choosing the device and provision available in education, job and in day-to-day life.

OUTCOMES:
At the end of this course the students will be:
- Know the role and importance of assist devices.
- Know the importance of rehabilitation and related aspects

TEXT BOOK:

REFERENCES:
OBJECTIVES:
Objective of the syllabus is to make students understand the principles of
- Assist devices
- Diathermy
- Extracorporeal devices
- Therapy and safety aspects of radiation

UNIT I  CARDIAC ASSIST DEVICES
Cardiac pacemakers-Need, types and functional characteristics, AC Cardiac defibrillators, disadvantages , DC defibrillator, types- Instantaneous , Synchronised

UNIT II  DIATHERMY
IR and UV lamp and its application. Short wave diathermy, ultrasonic diathermy, Microwave diathermy, Electro surgery machine - Current waveforms, Tissue Responses, Electro surgical current level, Hazards and safety procedures.

UNIT III  HEMODIALYSER AND HEART LUNG MACHINE
Indication and principle of Hemodyalisis, Dialasate, different types of Hemodialisers, monitoring systems, Need for heart lung machine, functioning of bubble, disc type and membrane type oxygenators, finger pump, roller pump, monitoring systems.

UNIT IV  RESPIRATORY AIDS
Ventilator- Need, Types, Intermittent positive pressure, breathing apparatus operating sequence, electronic IPPB unit with monitoring for all respiratory parameters, Humidifier, Nebulizer, Aspirator.

UNIT V  RADIATION THERAPY AND RADIATION SAFETY
Effects of ionising radiation, Radiation therapy – Cobalt Cesium therapy, linear accelerator, betatron, cyclotron, brachytherapy, , Radiation protection in medicine- radiation protection principles.

TOTAL: 45 PERIODS

OUTCOMES:
On completing the syllabus students are familiar with
- Assist devices
- Diathermy
- Extracorporeal devices
- Therapy and safety aspects of radiation

TEXT BOOK:

REFERENCES:
OBJECTIVES:
The student should be made to:
- Understand biological and statistical foundations of neural networks,
- Learn Perceptron, MLPs, SVMs, RBFN and competitive learning

UNIT I  NEURON MODEL NETWORK ARCHITECTURE

UNIT II  LEARNING PROCESS

UNIT III  PERCEPTRONS

UNIT IV  ATTRACTOR NEURAL NETWORK AND ART

UNIT V  PRINCIPAL COMPONENT ANALYSIS AND SELF ORGANIZATION

OUTCOMES:
At the end of the course, the student should be able to:
- Explain the mathematical foundations of neural network models.
- Design and implement neural network systems to solve real-world problems.

TEXT BOOKS:

REFERENCES:
MD6611  DIAGNOSTIC AND THERAPEUTIC EQUIPMENT LABORATORY  L T P C  0 0 3 2

OBJECTIVES:
- To provide practice on recording and analysis of different Bio potentials
- Study the function of different Therapeutic equipments.

LIST OF EXPERIMENTS:
1. Simulation of ECG – detection of QRS complex and heart rate
2. Study of shortwave and ultrasonic diathermy
3. Study of biotelemetry
4. Electrical safety measurements.
7. Study of ESU – cutting and coagulation modes
8. Recording of Audiogram
9. Design of ECG amplifier, recording and analysis using Lab View

LAB REQUIREMENTS FOR 30 STUDENTS
Multioutput power supply (+15v, -15v, +30V variable, +5V, 2A) 2 Nos.
Short wave Diathermy 1 No.
Ultrasound diathermy 1 No.
Single parameter biotelemetry system 1 No.
Electrical Safety Analyser 1 No.
Spirometry with associated analysis system 1 No.
ECG Simulator 1 No.
Medical stimulator 1 No
Surgical diathermy with analyzer 1 No
Audiometer 1 No
Lab View.

OUTCOMES:
- The learner is able to analyze the Bio medical signals, to check the safety of any medical equipments and to have the knowledge about therapeutic equipments.

MD6612  DIGITAL IMAGE PROCESSING LABORATORY  L T P C  0 0 3 2

OBJECTIVES:
- To practice the basic image processing techniques.
- To understand the functions of transforms.
- To know the effect of quantization.
- To explore the applications of image processing.

LIST OF EXPERIMENTS
Simulation using MATLAB (Image processing Tool Box) or equivalent software
1. Image sampling and quantization
2. Analysis of spatial and intensity resolution of images.
3. Intensity transformation of images.
4. DFT analysis of images
5. Transforms (Walsh, Hadamard, DCT, Haar)
6. Histogram Processing
7. Image Enhancement-Spatial filtering
8. Image Enhancement- Filtering in frequency domain
9. Image segmentation – Edge detection, line detection and point detection
10. Basic Morphological operations.
11. Basic Thresholding functions
12. Analysis of images with different color models.

MINI PROJECTS:
1. Applications to Biometric and security
2. Applications to Medical Images
3. Texture analysis with statistical properties
4. Boundary detection

OUTCOMES:
At the end of the course, the student should be able to:
- Perform filtering operations in the image
- Use transforms and analyse the characteristics of the image.
- Write program to analyse the texture of the image
- Implement project on simple image processing applications.
- Apply image processing technique to solve real world problems

Equipments for a batch of 30 students (2 students per experiment):
PCs with related accessories- 15
MATLAB (licensed) or any equivalent software with Image processing tool box

Image processing software tools

REFERENCE:

MD6701 PATTERN RECOGNITION AND ARTIFICIAL INTELLIGENCE

OBJECTIVES:
The course will provide basic competence in pattern recognition methods that can be used to construct systems for data mining, communications, signal analysis, computer vision, speech recognition, man-machine interaction, and intelligent systems.

UNIT I INTRODUCTION
Definition of AI, Intelligent agents, perception and language processing, problem solving, searching, heuristic searching, game playing, logics, logical reasoning.
UNIT II BASIC PROBLEMS SOLVING METHODS 9
Forward Vs background, knowledge representation, frame problems, heuristic functions, weak methods of matching.

UNIT III PRINCIPLES OF PATTERN RECOGNITION 9
Patterns and features, training and learning in pattern recognition approach, different types of pattern recognition.

UNIT IV DECISION MAKING 9
Baye’s theorem, multiple features, decision boundaries, estimation of error rates, histogram, kernels, window estimators, nearest neighbour classification, maximum distance pattern classifiers, adaptive decision boundaries.

UNIT V CLUSTER ANALYSIS AND FEATURE EXTRACTION 9
Unsupervised learning, hierarchical clustering, graph theories approach to pattern clustering, fuzzy pattern classifiers, application of pattern recognition in medicine.

TOTAL: 45 PERIODS

OUTCOMES
At the end of the course, the student should be able to:
- Explain fundamental pattern recognition and machine learning theories.
- Design and implement certain important pattern recognition techniques
- Apply the pattern recognition theories to applications of interest.

TEXT BOOKS:

REFERENCES:

MD6702 PHYSIOLOGICAL MODELING  L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- Understand and appreciate the value and application of Physiological models and Vital organs.
- Model dynamically varying physiological system
- Understand methods and techniques for analysis and synthesis of dynamic models
- Develop differential equations to describe the dynamic models, simulate and visualize, dynamic responses of physiological models using software.
UNIT I SYSTEM CONCEPT


UNIT II TRANSFER FUNCTION

System as an operator and use of Transfer function, Bio Engineering of coupled systems, Examples of transformed signals and circuits for transfer function with impedance concept- Development of lung model , Impedance of a two stage ladder network, Measurement of airway resistance.

UNIT III PERIODIC SIGNALS

Sinusoidal Functions, Analysis of Instrumentation to measure air flow system, second order system – representation of a respiratory system, Evaluation of Transfer function from frequency response for muscle response modes, Relationship between Phase lag and Time Delay-closed loop aspects of pupillary control system , Transient Resonance of an Undamped Second order system, General Description of Natural Frequency Damping, Physical Significance of under damped responses of post systolic operations in aortic arch.

UNIT IV FEEDBACK


UNIT V SIMULATION OF BIOLOGICAL SYSTEMS

Simulation of thermal regulation, pressure and flow control in circulation, occulo motor system, Endocrinal system, functioning of receptors, introduction to digital control system.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain application of Physiological models.
- Model dynamically varying physiological system
- Discuss methods and techniques to analyze and synthesis dynamic models
- Develop differential equations to describe the dynamic models, simulate and visualize
- Implement physiological models using software to get dynamic responses

TEXTBOOKS


REFERENCES:

OBJECTIVES:
The course will focus strongly on expert systems, but will provide scope for the examination of other areas of interest important to course participants. More specifically, the course objectives include:

- To develop informed opinions about the present and past opinion leaders in the artificial intelligence debate.
- To develop a simple, informal expert system by performing an effort of knowledge engineering of a real, human expert.
- To develop a series of Web pages that will serve as a current "state of the art" review of the various AI application areas, areas which may be suggested by the instructor or brought to the course by participants.
- To experience some actual hands-on demonstration software while accomplishing the review of current applications areas in AI.

UNIT I  INTRODUCTION TO AI
Definition of AI – importance of AI – problem solving, searching, heuristic searching.

UNIT II  KNOWLEDGE REPRESENTATION

UNIT III  EXPERT SYSTEMS
Expert system architecture - non-production systems architecture – knowledge acquisition and validation - Knowledge system building tools.

UNIT IV  LEARNING & DECISION MAKING
Types of learning – general learning model – learning by induction – generalization & specialization – inductive bios – explanation based learning

UNIT V  CASE STUDY

TOTAL: 45 PERIODS

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

- Explain the role of Artificial Intelligence, Expert Systems and Decision Models in managerial decision-making.
- Apply, build and modify decision models to solve real problems
- Design and develop Artificial Intelligence Based Decision Support Systems and discuss the role these systems play in the business environment.
- Explain Artificial Intelligence Technique.
- Build a prototype Artificial Intelligence Based Decision Support System.

REFERENCES:
OBJECTIVES:
The student should be made to:
- Describe the most common techniques for generating biomedical images
- Understand the physical principles, usages and limitations of each imaging modality
- Enumerate which physical or physiological properties can be measured with each modality
- Recognize the different imaging systems and their basic parts

UNIT I  PRINCIPLES OF RADIOGRAPHIC EQUIPMENTS  8
X-Ray tubes, cooling systems, removal of scatters, construction of image Intensifier tubes, angiographic setup, digital radiology.

UNIT II  COMPUTER AIDED TOMOGRAPHY  10
Need for sectional images, Principles of sectional scanning, Method of convolution and Back-Propagation, Methods of reconstruction, Artifacts, Principle of 3D imaging

UNIT III  RADIO ISOTOPIC IMAGING  9
Radiation detectors, Radio isotopic imaging equipments, scanners, Principle of semiconductor detectors, Gamma ray camera, Positron Emission tomography. SPECT.

UNIT IV  ULTRASONIC SYSTEMS  9
Wave propagation and interaction in Biological tissues, Acoustic radiation, continuous and pulsed excitation, Transducers and imaging systems, Scanning methods, Principle of image generation.

UNIT V  MAGNETIC RESONANCE IMAGING  9
Principles of MRI, Relaxation processes and their measurements, Pulse sequencing and MR image acquisition and Reconstruction.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Explain the physical interaction mechanisms for ultrasound, X-ray, CT, MR, SPECT, and PET scanning.
- Explain back-projection algorithms used in CT, MR, and PET scanners.

TEXT BOOK:

REFERENCES:
OBJECTIVES:
The student should be made to:
Study various medical expert systems and to develop various medical applications

List of Experiments:
EXPERT SYSTEMS LAB:
1. Study of Medical Expert systems.
   - MYCIN
   - PUFF
   - Fuzzy diagnostic systems
   - Neural network based Expert systems
   - Support vector Machine – Expert systems

2. Development of Medical Expert systems
   - Hospital Management
   - Respiratory disorder
   - Fetal Monitoring System
   - Heart rater variability monitoring
   - Monitoring in Diabetes Milletes

OUTCOMES:
At the end of the Laboratory course, the student should be able to:
- Design expert systems using Artificial Intelligence and Decision making models.
- Apply, build and modify decision models to solve real problems
- Build a prototype for medical diagnosis or measurement system with artificial Intelligence and decision support system.

Lab Requirements:
- Study of Medical Expert systems
- MYCIN, PUFF Expert system
- MATLAB with FUZZY, Neural Network tool box user licence (VERSION)
- PC with related accessories (Nos.)

Development of Medical Expert systems
- Software
- Front end: VB/VC ++/JAVA
- Back end: Oracle 11g, my SQL, DB2
- Platform: Windows 2000 Professional/XP
- Oracle server could be loaded and can be connected from individual PCs.
- PC with related accessories (Nos. 1 system per 2 students)

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:

MD6811  
PROJECT WORK  
L T P C  0 0 12 6

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

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

TOTAL: 180 PERIODS

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

BM6401  
MEDICAL PHYSICS  
L T P C  3 0 0 3

OBJECTIVES:
- To Study effects of sound and light in human body
- To study effects of radiation in matter and how isotopes are produced

UNIT I  
NON IONIZING RADIATION AND ITS MEDICAL APPLICATION  9
Non-ionizing Electromagnetic Radiation: Overview of non-ionizing radiation effects
Low Frequency Effects- Higher frequency effects. Physics of light, Measurement of light and its unit- limits of vision and color vision an overview, Thermography– Application

UNIT II  
SOUND IN MEDICINE  9
Physics of sound, Normal sound levels –ultrasound fundamentals – Generation of ultrasound (Ultrasound Transducer) - Interaction of Ultrasound with matter; Cavitations, Reflection, Transmission- Scanning systems – Artefacts- Ultrasound- Doppler-Double Doppler shift-Clinical Applications

UNIT III  
PRINCIPLES OF RADIOACTIVE NUCLIDES  9
Radioactive Decay – Spontaneous Emission – Isometric Transition – Gamma ray emission, alpha, beta, Positron decay, electron capture, Sources of Radioisotopes Natural and Artificial radioactivity, Radionuclide used in Medicine and Technology ,Decay series, Production of radionuclides – Cyclotron produced Radionuclide- Reactor produced Radio- nuclide-fission and electron Capture reaction, radionuclide Generator-Technetium generator.

UNIT IV  
INTERACTION OF RADIATION WITH MATTER  9
UNIT V  BASIC RADIATION QUANTITIES
Introduction -exposure- Inverse square law-KERMA-Kerma and absorbed dose –stopping power - relationship between the dosimetric quantities - Bremsstrahlung radiation, Bragg’s curve- concept of LD 50- Stochastic and Non-stochastic effects, Different radiation Unit, Roentgen, gray, Sievert.

OUTCOMES:
At the end of the course, the student should be able to:
- Analyze mechanics involved with various physiological systems.
- Perform derivation of mathematical models related to blood vessels

TEXT BOOKS:

REFERENCES:
3. J.P.Woodcock,Ulttrasonic,Medical Physics Handbook series 1,Adam Hilger,Bristol,2002

EC6016  OPTO ELECTRONIC DEVICES  L T P C
3 0 0 3

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  9
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:

MD6001  GENETIC ALGORITHMS  L T P C
3 0 0 3

OBJECTIVES:
The student should be:
- Be exposed to Evolutionary computation
- Be familiar With Genetic Programming

UNIT I  INTRODUCTION TO EVOLUTIONARY COMPUTATION  9

UNIT II  SEARCH AND SELECTION OPERATORS  9

UNIT III  EVOLUTIONARY COMBINATORIAL OPTIMIZATION  9
TSP - Evolutionary algorithms for TSPs – Hybrid evolutionary and local search algorithms. Schema theorems - Convergence of EAs - Computational time complexity of EAs - No free lunch theorem.

UNIT IV  CONSTRAINT HANDLING  9

UNIT V  GENETIC PROGRAMMING  9
Trees as individuals - Major steps of genetic programming-, functional and terminal sets - initialization-crossover-mutation- fitness evaluation – Search operators on trees – Examples.

TOTAL: 45 PERIODS
OUTCOMES:
Upon Completion of the course, the students will be able to
• Design Evolutionary Algorithms for multi-objective optimization problem
• Apply Genetic programming to solve optimization problem

TEXT BOOKS:

REFERENCES:

CS6013 FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT

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 into 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
UNIT II REQUIREMENTS AND SYSTEM DESIGN

UNIT III DESIGN AND TESTING

UNIT IV SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT

UNIT V BUSINESS DYNAMICS ENGINEERING SERVICES INDUSTRY

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 theUNITS. 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:

MD6002  COMPUTER VISION

OBJECTIVES:
The student should be made to:
- Understand standard advanced image processing algorithms.
- Learn image processing system development.
- Know team design techniques.
- Develop algorithm and test the Interface.

UNIT I  DIGITAL IMAGE PROCESSING FUNDAMENTALS
Digital image representation – an image model – digital image processing transforms – overview of L-transforms – transforms and Fourier Transforms

UNIT II  IMAGE PROCESSING & SEGMENTATION

UNIT III  BOUNDARY DETECTION
Edge finding – surface orientation – optical flow – design – growing.

UNIT IV  IMAGE REPRESENTATION
Texture – texture as pattern recognition problem – two and three dimensional geometric structures – boundary representation- regions representation – shape properties knowledge representation and use.

UNIT V  MATCHING AND INFERENCE

TOTAL : 45 PERIODS
OUTCOMES:
At the end of the course, the student should be able to:
- Explain digital image processing fundamentals: hardware and software, digitization, enhancement and restoration, encoding, segmentation, feature detection
- Apply image processing techniques in both the spatial and frequency (Fourier) domains
- Write image processing programs in a high-level language such as C++

TEXT BOOK:

REFERENCES:

CS6012 SOFT COMPUTING

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

UNIT I INTRODUCTION

UNIT II NEURAL NETWORKS

UNIT III FUZZY LOGIC
UNIT IV  GENETIC ALGORITHM

UNIT V  HYBRID SOFT COMPUTING TECHNIQUES & APPLICATIONS

OUTCOMES:
Upon completion of the course, the student should be able to:
- Apply various soft computing frame works
- Design of various neural networks
- Use fuzzy logic
- Apply genetic programming
- Discuss hybrid soft computing

TEXT BOOKS:

REFERENCES:

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/
OBJECTIVES:
- In this course, the MOS circuit realization of the various building blocks that is common to any microprocessor or digital VLSI circuit is studied.
- Architectural choices and performance tradeoffs involved in designing and realizing the circuits in CMOS technology are discussed.
- The main focus in this course is on the transistor circuit level design and realization for digital operation and the issues involved as well as the topics covered are quite distinct from those encountered in courses on CMOS Analog IC design.

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

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

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

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

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

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.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
The student should be made to:
- Perform high standard maintenance program for safety, efficient and effective applications
- Manage risks associated with the equipment use.
- Support and enhance Services to support and enhance patient care by providing exemplary management and service of medical technology,
- Implement programs to ensure its safe and effective clinical use.

UNIT I INTRODUCTION TO BIOCHEMISTRY 9

UNIT II INTRODUCTION TO ANATOMY 9
Surface and regional anatomy, cells, tissues and organs. Terminology.

UNIT III PHYSIOLOGICAL MEASUREMENT 9
Introduction to physiological measurement. Common parameters to be measured. Special considerations for measurement. Measurement examples: electro cardiology, audiology.

UNIT IV CARDIO VASCULAR SYSTEM MEASUREMENT 9
The heart’s specialized conduction system. Use of the electrocardiogram in the diagnosis of various conditions of the cardiovascular system. Human hearing. Audiological testing in diagnosis and remediation.

UNIT V MANUFACTURE, MANAGEMENT AND SAFETY OF MEDICAL EQUIPMENT 9

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Explain Basic human anatomy
- Perform Cardio Vascular Measurement
- Practice safety issues regarding medical equipments.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
The student should be made to:
- Expose to Tissue Engineering
- Understand the Cell cycle and differentiation
- Be familiar with stem cells.
- Understand different synthetic and biomaterials

UNIT I  FUNDAMENTALS OF TISSUE ENGINEERING  9
Tissue exchange and tissue development - Objectives of tissue engineering - Laboratory set up for tissue engineering. Cell cycle and differentiation - cell adhesion - cell adhesion molecules - cell migration - cell aggregation and tissue equivalent.

UNIT II  STEM CELLS  9
Definition of stem cells – types of stem cells – differentiation, dedifferentiation maturation, proliferation, pluripotency and immortalization. Sources of stem cells: haematopoetic – fetal - cord blood – placenta - bone marrow - primordial germ cells - cancer stem cells - induced pleuripotent stem cells.

UNIT III  COMPONENTS OF TISSUE ENGINEERING  9

UNIT IV  MATERIALS IN TISSUE ENGINEERING  9

UNIT V  APPLICATION OF TISSUE ENGINEERING  9

TOTAL : 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to
- Explain the components of Tissue Engineering
- Use appropriate materials in tissue engineering
- Apply Tissue Engineering in different fields

TEXT BOOKS:

REFERENCES:
1. Gray E. Wnek, Gray L Browlin – Encyclopedia of Biomaterials and Biomedical Engineering – Marcel Dekker Inc New York 2004,
OBJECTIVES:
The student should be made to:
- Understand VLSI circuit technologies
- Be exposed to discrete Fourier transforms.
- Be familiar with signal processing concepts in systems
- Be exposed to DSP architectures

UNIT I DSP INTEGRATED CIRCUITS AND VLSI CIRCUIT TECHNOLOGIES 9
Standard digital signal processors, Application specific IC’s for DSP, DSP systems, DSP system
design, Integrated circuit design. MOS transistors, MOS logic, VLSI process technologies, Trends in
CMOS technologies.

UNIT II DIGITAL SIGNAL PROCESSING 9
Digital signal processing, Sampling of analog signals, Selection of sample frequency, Signal-
processing systems, Frequency response, Transfer functions, Signal flow graphs, Filter structures,
Adaptive DSP algorithms, DFT-The Discrete Fourier Transform, FFT-The Fast Fourier Transform
Algorithm, Image coding, Discrete cosine transforms.

UNIT III DIGITAL FILTERS AND FINITE WORD LENGTH EFFECTS 9
FIR filters, FIR filter structures, FIR chips, IIR filters, Specifications of IIR filters, Mapping of analog
transfer functions, Mapping of analog filter structures, Multirate systems, Interpolation with an integer
factor L, Sampling rate change with a ratio L/M, Multirate filters. Finite word length effects -Parasitic
oscillations, Scaling of signal levels, Round-off noise, Measuring round-off noise, Coefficient
sensitivity, Sensitivity and noise.

UNIT IV DSP ARCHITECTURES AND SYNTHESIS OF DSP ARCHITECTURES 9
DSP system architectures, Standard DSP architecture, Ideal DSP architectures, Multiprocessors and
multicomputers, Systolic and Wave front arrays, Shared memory architectures. Mapping of DSP
algorithms onto hardware, Implementation based on complex PEs, Shared memory architecture with
Bit – serial PEs.

UNIT V ARITHMETIC UNITS AND INTEGRATED CIRCUIT DESIGN 9
Conventional number system, Redundant Number system, Residue Number System, Bit-parallel and
Bit-Serial arithmetic, Basic shift accumulator, Reducing the memory size, Complex multipliers,
Improved shift-accumulator. Layout of VLSI circuits, FFT processor, DCT processor and Interpolator
as case studies. Cordic algorithm.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, students will be able to:
- Perform frequency transforms for the signals
- Design IIR and FIR filters
- Map DSP algorithms onto hardware
- Design applications based on the digital filters

TEXT BOOK:

REFERENCES
2. Emmanuel C. Ifeachor, Barrie W. Jervis, “Digital signal processing – A practical approach”,
   & Sons, 1999.
OBJECTIVE:
- To facilitate the understanding of Quality Management principles and process.

UNIT I INTRODUCTION

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

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

UNIT IV TQM TOOLS AND TECHNIQUES II

UNIT V QUALITY SYSTEMS

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

TEXT BOOK:

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

UNIT I  

UNIT II  

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

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

UNIT V  

TOTAL : 45 PERIODS

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

REFERENCES:
OBJECTIVE:
The student should be made to:
- Know basic nano technological principles and characterization methods
- Understand the essential features of biology and nanotechnology that are converging to create the new areas of bionanotechnology and nano medicine.

UNIT I INTRODUCTION

UNIT II CARBON NANOTUBES, NANOWIRES, AND NANOCRYSTALS

UNIT III NANO TECHNOLOGY IN MEDICINE AND HEALTH
Cardiovascular Diseases, Cancer Detection and Diagnosis, Diabetes and Nanotechnology, Implants and Prosthetics Nanotechnology and Burn Victims, Diagnosis and Therapy, Drug Delivery Using Nanoparticles, Nanotechnology Fights Infections, Pharmaceutical Nanotechnology Research.

UNIT IV NANOMATERIALS AND NANOSYSTEMS FOR BIOMEDICAL APPLICATIONS

UNIT V RISKS, ETHICS AND LAWS

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Implement Nanotechnology related new findings in the area of nanomedicine.

TEXT BOOK:

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

UNIT I BASIC CONCEPTS
10

UNIT II SPEECH ANALYSIS
10

UNIT III SPEECH MODELING
8

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

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

TOTAL: 45 PERIODS

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

TEXT BOOKS:
REFERENCES:

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OBJECTIVES:
The student should be made to:
- Learn about body area networks' and different hardwares related to it
- Provide knowledge in the applications of Body Area Networks.

UNIT I  INTRODUCTION
Definition, BAN and Healthcare, Technical Challenges- Sensor design, biocompatibility, Energy Supply, optimal node placement, number of nodes, System security and reliability, BSN Architecture – Introduction

UNIT II  HARDWARE FOR BAN

UNIT III  WIRELESS COMMUNICATION AND NETWORK
RF communication in Body, Antenna design and testing, Propagation, Base Station-Network topology-Stand –Alone BAN, Wireless personal Area Network Technologies-IEEE 802.15.1,IEEE P802.15.13, IEEE 802.15.14, Zigbee

UNIT IV  COEXISTENCE ISSUES WITH BAN
Interferences – Intrinsic - Extrinsic, Effect on transmission, Counter measures- on physical layer and data link layer, Regulatory issues-Medical Device regulation in USA and Asia, Security and Self protection-Bacterial attacks, Virus infection ,Secured protocols, Self protection.

UNIT V  APPLICATIONS OF BAN
Monitoring patients with chronic disease, Hospital patients, Elderly patients, Cardiac arrhytmias monitoring, Multi patient monitoring systems, Multichannel Neural recording, Gait analysis, Sports Medicine, Electronic pill

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Explain about working of Body Area Network
- Discuss the applications of BAN.

TEXT BOOK:
REFERENCES:

OBJECTIVES:
The student should be made to:
- Be familiar with objective property of tissues
- Be exposed to Optical Holography

UNIT I  OPTICAL PROPERTIES OF THE TISSUES
Refraction, scattering, absorption, light transport inside the tissue, tissue properties, Light interaction with tissues, optothermal interaction, fluorescence, speckles.

UNIT II  INSTRUMENTATION IN PHOTONICS
Instrumentation for absorption, scattering and emission measurements, excitation light sources – high pressure arc lamp, solid state LEDs, optical filters, polarisers, time resolved and phase resolved detectors.

UNIT III  APPLICATIONS OF LASERS
Laser in tissue welding, lasers in dermatology, lasers in ophthalmology, otolaryngology, urology.

UNIT IV  OPTICAL HOLOGRAPHY
Wave fronts, interference patterns, principle of hologram, optical hologram, applications.

UNIT V  SPECIAL TECHNIQUES
Near field imaging of biological structures, in-vitro clinical diagnostic, fluorescent spectroscopy, photodynamic therapy.

OUTCOMES:
Upon Completion of the course, the students will be able to:
- Apply lasers in different areas of medicine.
- Explain the special techniques of Lasers.
- Use the Photonics instrumentation.

TEXT BOOKS

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

UNIT I  HIGH PERFORMANCE CISC ARCHITECTURE – PENTIUM  

UNIT II  HIGH PERFORMANCE RISC ARCHITECTURE – ARM  

UNIT III  ARM APPLICATION DEVELOPMENT  

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

UNIT V  PIC MICROCONTROLLER  

TOTAL: 45 PERIODS

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

TEXT BOOK:

REFERENCES:

Readings: Web links www.ocw.nit.edu  www.arm.com
OBJECTIVE:
The student should be made to:
• Learn advanced 8086 family of processors, motherboards, PC based data acquisition and troubleshooting of PCs.

UNIT I INTEL ADVANCED PROCESSORS
80186, 80286, 80386, 80486 - Architecture, Memory management.

UNIT II PENTIUM PROCESSORS
Pentium Architecture - Memory Management - Pentium Pro microprocessors – Pentium II, Pentium III, Pentium 4 – Special features and software changes.

UNIT III PC HARDWARE OVERVIEW
Functional units & Interconnection, New generation motherboards 286 to Pentium 4 Bus interface – ISA – EISA- VESA- PCI- PCIX, Memory and I/O port addresses, Peripheral interfaces and controller.

UNIT IV PC BASED DATA ACQUISITION
Plug in data acquisition and control boards and programming- ADC, DAC, Digital I/O board and Timing Board, Serial port and parallel port programming. Data acquisition and programming using serial interfaces- PC and microcontroller serial ports, USB and IEEE 1394.

UNIT V TROUBLESHOOTING, MAINTAINING & REPAIRING
Memory troubleshooting, Monitor troubleshooting, Motherboard troubleshooting, Port troubleshooting, Sound Boards and Video adapters troubleshooting, USB troubleshooting.

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• Explain 8086 family of processors, motherboards, PC based data acquisition and troubleshooting of PCs

TEXT BOOKS:

REFERENCE:
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:
OBJECTIVE:
- To give an idea about IPR, registration and its enforcement.

UNIT I INTRODUCTION
Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT II REGISTRATION OF IPRs
Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad

UNIT III AGREEMENTS AND LEGISLATIONS

UNIT IV DIGITAL PRODUCTS AND LAW

UNIT V ENFORCEMENT OF IPRs
Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.

TOTAL : 45 PERIODS

OUTCOME:
- Ability to manage Intellectual Property portfolio to enhance the value of the firm.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

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

UNIT I INTRODUCTION TO DISASTERS

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

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR)

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

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT

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

UNIT IV DISASTER RISK MANAGEMENT IN INDIA

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

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

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

OUTCOMES:
The students will be able to

- Differentiate the types of disasters, causes and their impact on environment and society.
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.
MD6009 BIO SIGNAL PROCESSING

OBJECTIVES:
The student should be made to:
- Integrate application-oriented signal processing techniques for biomedical signal analysis;
- Discuss the selection of biosignal processing techniques for real biomedical signals;
- Evaluate effects of different biomedical signal processing approaches using Matlab

UNIT I BIO SIGNAL WAVE SHAPES
Introduction to Biomedical signals - overview and characteristics of ECG, EMG, EEG, EGG, PCG, Carotid pulse, EOG, VMG, VAG, and Otto acoustic emission signals

UNIT II TIME SERIES ANALYSIS AND SPECTRAL ESTIMATION

UNIT III REMOVAL OF ARTIFACTS

UNIT IV BIO SIGNAL PATTERN CLASSIFICATION AND DIAGNOSTIC DECISION
Pattern classification as applied to Bio signals-supervised pattern classification unsupervised pattern classification-Probabilistic models and statistical training and test steps-Neural networks-measures of diagnostic accuracy and cost-Reliability of classifiers and decisions.

UNIT V SPECIAL TOPICS IN BIO SIGNAL PROCESSING
Application of wavelet transform-TFR representation-ECG Characterization- wavelet networks-data compression of ECG and EEG signals.

OUTCOMES:
At the end of the course, the student should be able to:
- Choose a class of signal mode.
- Select a specific form of the model.
- Process the signal.
- Apply wavelets in data compression.
TEXT BOOKS:

REFERENCES

BM6009 BIO MEMS

OBJECTIVES:

The student should be made to:
• Learn various MEMS fabrication techniques.
• Understand different types of sensors and actuators and their principles of operation at the micro scale level.
• Know the application of MEMS in different field of medicine.

UNIT I MEMS MATERIALS AND FABRICATION

Typical MEMS and Microsystems, materials for MEMS - active substrate materials-Silicon and its compounds, Silicon piezoresistors, Gallium Arsenide, quartz, polymers. Micromachining-photolithography, thin film deposition, doping, etching, bulk machining, wafer bonding, LIGA

UNIT II MECHANICAL AND THERMAL SENSORS AND ACTUATORS

Mechanics for MEMs design- static bending of thin plates, mechanical vibration, thermomechanics, fracture and thin film mechanics. Mechanical sensors and actuators – beam and cantilever – microplates, strain, pressure and flow measurements, Thermal sensors and actuators- actuator based on thermal expansion, thermal couples, thermal resistor, Shape memory alloys- Inertia sensor, flow sensor

UNIT III ELECTROSTATIC AND PIEZOELECTRIC SENSORS AND ACTUATORS

Parallel plate capacitor, pull in effect, Electrostatic sensors and actuators- Inertia sensor, Pressure sensor, flow sensor, tactile sensor, comb drive. Properties of piezoelectric materials, Piezoelectric sensor and actuator – inchworm motor, inertia sensor, flow sensor.

UNIT IV MICROFLUIDIC SYSTEMS

Fluid dynamics, continuity equation, momentum equation, equation of motion, laminar flow in circular conduits, fluid flow in microconduits, in submicrometer and nanoscale. Microscale fluid, expression for liquid flow in a channel, fluid actuation methods, dielectrophoresis, microfluid dispenser, microneedle, micropumps-continuous flow system, micromixers

UNIT V APPLICATIONS OF BIOMEMS

CAD for MEMs, Drug delivery, micro total analysis systems (MicroTAS) detection and measurement methods, microsystem approaches to polymerase chain reaction (PCR), DNA sensor, MEMS based drug delivery

TOTAL: 45 PERIODS
OUTCOMES:
At the end of the course, the student should be able to:
• Discuss various MEMS fabrication techniques.
• Explain different types of sensors and actuators and their principles of operation at the micro Scale level.
• Apply MEMS in different field of medicine.

TEXT BOOKS:

REFERENCES:

BM6002 BIOMETRIC SYSTEMS L T P C
3 0 0 3

OBJECTIVES:
• To understand the technologies of fingerprint, iris, face and speech recognition
• To understand the general principles of design of biometric systems and the underlying trade-offs.
• To recognize personal privacy and security implications of biometrics based identification technology.
• To identify issues in the realistic evaluation of biometrics based systems.

UNIT I INTRODUCTION TO BIOMETRICS

UNIT II FINGERPRINT TECHNOLOGY

UNIT III FACE RECOGNITION AND HAND GEOMETRY
Introduction to face recognition, Neural networks for face recognition – face recognition from correspondence maps – Hand geometry – scanning – Feature Extraction - Adaptive Classifiers - Visual-Based Feature Extraction and Pattern Classification - feature extraction – types of algorithm – Biometric fusion.
UNIT IV  MULTIMODAL BIOMETRICS AND PERFORMANCE EVALUATION  

UNIT V  BIOMETRIC AUTHENTICATION  

OUTCOMES:
At the end of the course, the student should be able to:
• Demonstrate knowledge engineering principles underlying biometric systems.
• Analyze design basic biometric system applications.

TEXT BOOKS:

REFERENCES:

MD6010  
TELEHEALTH TECHNOLOGY  

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OBJECTIVES:
The student should be made to:
• Learn the key principles for telemedicine and health.
• Understand telemedical technology.
• Know telemedical standards, mobile telemedicine and it applications.

UNIT I  TELEMEDICINE AND HEALTH  
History and Evolution of telemedicine, Functional diagram of telemedicine system, Telemedicine, Telehealth, Tele care, Organs of telemedicine, Global and Indian scenario, Ethical and legal aspects of Telemedicine - Confidentiality, Social and legal issues, Safety and regulatory issues, Advances in Telemedicine.
UNIT II TELEMEDICAL TECHNOLOGY

UNIT III TELEMEDICAL STANDARDS

UNIT IV MOBILE TELEMEDICINE
Tele radiology: Definition, Basic parts of teleradiology system: Image Acquisition system Display system, Tele pathology, multimedia databases, color images of sufficient resolution, Dynamic range, spatial resolution, compression methods, Interactive control of color, Medical information storage and management for telemedicine - patient information medical history, test reports, medical images diagnosis and treatment. Hospital information system - Doctors, paramedics, facilities available. Pharmaceutical information system.

UNIT V TELEMEDICAL APPLICATIONS

OUTCOMES:
At the end of the course, the student should be able to:
1. Apply multimedia technologies in telemedicine.
2. Explain Protocols behind encryption techniques for secure transmission of data.
3. Apply telehealth in healthcare.

TEXT BOOK:

REFERENCES: