PROGRAM EDUCATIONAL OBJECTIVES:
The objectives of the B.E Bio Medical Engineering programme is broadly defined on the following:
1. Prepare the students to comprehend the fundamental concepts in Bio Medical Engineering
2. Enable the students to relate theory with practice for problem solving
3. Enable the students to critically analyse the present trends and learn and understand future issues
4. Motivate the students to continue to pursue lifelong learning as professional engineers and scientists and effectively communicate the technical details and to work effectively in teams of multidisciplinary nature and to apply Bio Medical Engineering solutions to the society
5. Enhance the capability of the students to analyse existing healthcare systems in general and also in specific areas to find innovative and cost effective solutions to the healthcare industry and hence may lead to entrepreneurial initiatives

PROGRAM OUTCOMES:
Students will be able to:
a) Apply life science, engineering and mathematical concepts in modeling and design of biomedical systems of varying complexity
b) Critically analyse a problem, identify and formulate solution in the field of Bio Medical Engineering taking into consideration the current trends and future issues
c) Design a component, system or a process to meet the needs within realistic constraints such as economic, safety and sustainability in the field of Bio Medical Engineering
d) Work effectively in teams of multidisciplinary nature to accomplish a goal
e) Communicate efficiently to an audience of multidisciplinary nature and to prepare technical documents and to present effectively
f) Analyse and understand the impact of healthcare delivery on individuals and society
g) Understand the need and possess the ability for lifelong learning to have continuous professional development
h) Ability to understand ethical and professional responsibilities
i) Demonstrate advanced knowledge of a selected area within Bio Medical Engineering
j) Critically analyse the current healthcare systems and develop innovative solutions
MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVE WITH PROGRAMME OUTCOMES

A broad relation between the programme objectives and the outcomes is given in the following table.

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A broad relation between the programme outcomes and the course outcomes is given in the following table:

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| SEM 5 | Diagnostic and Therapeutic Equipment I | √ | √ | √ | √ | √ | √ |
| SEM 5 | Microprocessors and Microcontrollers | √ | √ | √ | √ | √ | √ |
| SEM 5 | Discrete Time Signal Processing | √ | √ | √ | √ | √ | √ |
| SEM 5 | Data structures and Object Oriented Programming in C++ | √ | √ | √ | √ | √ | √ |
| SEM 5 | Professional Elective – I | √ | √ | √ | √ | √ | √ |
| SEM 5 | Microcontroller and Interfacing laboratory | √ | √ | √ | √ | √ | √ |
| SEM 5 | Discrete Time Signal Processing Laboratory | √ | √ | √ | √ | √ | √ |

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| YEAR 3 | Diagnostic and Therapeutic Equipment –II | √ | √ | √ | √ | √ | √ |
| YEAR 3 | Pathology and Microbiology | √ | √ | √ | √ | √ | √ |
| YEAR 3 | Radiological Equipment | √ | √ | √ | √ | √ | √ |
| YEAR 3 | Professional Elective –II | √ | √ | √ | √ | √ | √ |
| YEAR 3 | Professional Elective –III | √ | √ | √ | √ | √ | √ |
| YEAR 3 | Diagnostic and Therapeutic Equipment Laboratory | √ | √ | √ | √ | √ | √ |
| YEAR 3 | Pathology and Microbiology Laboratory | √ | √ | √ | √ | √ | √ |</p>
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*Attested*

Salim

DIRECTOR

Centre For Academic Courses
Anna University, Chennai-600 025

PROGRESS THROUGH KNOWLEDGE
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### UNIVERSITY DEPARTMENTS
### B. E. BIOMEDICAL ENGINEERING
### REGULATIONS – 2015
### CHOICE BASED CREDIT SYSTEM
### CURRICULA AND SYLLABI I - VIII SEMESTERS

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## SUMMARY

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Non Credit / Mandatory
COURSE DESCRIPTION:
This course aims at developing the language skills necessary for the first year students of Engineering and Technology.

OBJECTIVES:
- To develop the four language skills – Listening, Speaking, Reading and Writing.
- To improve the students’ communicative competence in English.
- To teach students the various aspects of English language usage.

CONTENTS:

UNIT I GREETING AND INTRODUCING ONESELF 12
Listening - Types of listening – Listening to short talks, conversations; Speaking – Speaking about one’s place, important festivals etc. – Introducing oneself, one’s family/friend; Reading – Skimming a passage– Scanning for specific information; Writing – Guided writing - Free writing on any given topic (My favourite place/Hobbies/School life, writing about one’s leisure time activities, hometown, etc); Grammar – Tenses (present and present continuous) -Question types - Regular and irregular verbs; Vocabulary – Synonyms and Antonyms.

UNIT II GIVING INSTRUCTIONS AND DIRECTIONS 12
Listening – Listening and responding to instructions; Speaking – Telephone etiquette - Giving oral instructions/Describing a process – Asking and answering questions; Reading – Reading and finding key information in a given text - Critical reading - Writing –Process description( non-technical)- Grammar – Tense (simple past& past continuous) - Use of imperatives – Subject – verb agreement – Active and passive voice; - Vocabulary – Compound words – Word formation – Word expansion (root words).

UNIT III READING AND UNDERSTANDING VISUAL MATERIAL 12
Listening- Listening to lectures/ talks and completing a task; Speaking –Role play/ Simulation – Group interaction; Reading – Reading and interpreting visual material; Writing- Jumbled sentences – Discourse markers and Cohesive devices – Essay writing (cause & effect/narrative);Grammar – Tenses (perfect), Conditional clauses –Modal verbs; Vocabulary –Cause and effect words; Phrasal verbs in context.

UNIT IV CRITICAL READING AND WRITING 12
Listening- Watching videos/ documentaries and responding to questions based on them; Speaking Informal and formal conversation; Reading –Critical reading (prediction & inference);Writing–Essay writing ( compare & contrast/ analytical) – Interpretation of visual materials; Grammar – Tenses (future time reference);Vocabulary – One word substitutes (with meanings) – Use of abbreviations & acronyms – Idioms in sentences.

UNIT V LETTER WRITING AND SENDING E-MAILS 12
Listening- Listening to programmes/broadcast/ telecast/ podcast; Speaking – Giving impromptu talks, Making presentations on given topics- Discussion on the presentation; Reading–Extensive reading; Writing- Poster making – Letter writing (Formal and E-mail) ;Grammar – Direct and Indirect speech – Combining sentences using connectives; Vocabulary –Collocation;

TEACHING METHODS:
Interactive sessions for the speaking module.
Use of audio – visual aids for the various listening activities.
Contextual Grammar Teaching.

EVALUATION PATTERN:
Internals – 50%
End Semester – 50%
OUTCOMES:
• Students will improve their reading and writing skills
• Students will become fluent and proficient in communicative English
• Students will be able to improve their interpersonal communication

TEXTBOOK:

REFERENCES:
3. Redston, Chris & Gillies Cunningham Face2Face (Pre-intermediate Student’s Book& Workbook) Cambridge University Press, New Delhi: 2005

MA7151  MATHEMATICS – I  L  T  P  C
(Common to all branches of B.E. / B.Tech. Programmes in 4  0  0  4
I Semester)

OBJECTIVES:
• The goal of this course is for students to gain proficiency in calculus computations. In calculus, we use three main tools for analyzing and describing the behavior of functions: limits, derivatives, and integrals. Students will use these tools to solve application problems in a variety of settings ranging from physics and biology to business and economics.
• To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
• To familiarize the student with functions of several variables. This is needed in many branches of engineering.
• To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I  DIFFERENTIAL CALCULUS  12
Representation of functions - New functions from old functions - Limit of a function - Limits at infinity - Continuity - Derivatives - Differentiation rules - Polar coordinate system - Differentiation in polar coordinates - Maxima and Minima of functions of one variable.

UNIT II  FUNCTIONS OF SEVERAL VARIABLES  12

18
UNIT III INTEGRAL CALCULUS 12
Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV MULTIPLE INTEGRALS 12

UNIT V DIFFERENTIAL EQUATIONS 12

TOTAL: 60 PERIODS

OUTCOMES:
- Understanding of the ideas of limits and continuity and an ability to calculate with them and apply them.
- Improved facility in algebraic manipulation.
- Fluency in differentiation.
- Fluency in integration using standard methods, including the ability to find an appropriate method for a given integral.
- Understanding the ideas of differential equations and facility in solving simple standard examples.

TEXTBOOKS:

REFERENCES:
PH7151                                         ENGINEERING PHYSICS
(LT PC Common to all branches of B.E / B.Tech programmes)  3003

OBJECTIVE:

- To introduce the concept and different ways to determine moduli of elasticity and applications.
- To instill the concept of sound, reverberation, noise cancellation, and ultrasonic generation, detection and applications.
- To inculcate an idea of thermal properties of materials, heat flow through materials and quantum physics.
- To promote the basic understanding of interferometers, principles and applications of lasers, optical fibers and sensors.
- To establish a sound grasp of knowledge on the basics, significance and growth of single crystals.

UNIT I         PROPERTIES OF MATTER
9

UNIT II         ACOUSTICS AND ULTRASONICS
9

UNIT III        THERMAL AND MODERN PHYSICS
9

UNIT IV         APPLIED OPTICS
9

UNIT V         CRYSTAL PHYSICS
9
Single crystalline, polycrystalline and amorphous materials – Single crystals: unit cell, crystal systems, Bravais lattices, detections and planes in a crystal, Miller indices - interplanar distance for a cubic crystal - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - structure and significance of NaCl, CsCl, ZnS and graphite - crystal imperfections: point defects, line defects – Burger vectors, dislocations and stacking faults – Growth of single crystals: Bridgman and Czochralski methods.

TOTAL: 45 PERIODS
OUTCOME:
- The students will understand different moduli of elasticity, their determination and applications.
- The students will gain knowledge on the properties of sound, noise cancellation, and production, detection and applications of ultrasonics.
- The students will acquire sound knowledge on thermal expansion and thermal conductivity of materials. Further they will gain an idea of quantum physics.
- The students will gain knowledge on interferometers, lasers and fiber optics.
- The students will secure knowledge on the basics of crystal structures and their significance. Further they gain basic ideas of growing single crystals.

TEXT BOOKS:

REFERENCES:

CY7151 ENGINEERING CHEMISTRY

OBJECTIVES:
- To develop an understanding about fundamentals of polymer chemistry.
- Brief elucidation on surface chemistry and catalysis.
- To develop sound knowledge photochemistry and spectroscopy.
- To impart basic knowledge on chemical thermodynamics.
- To understand the basic concepts of nano chemistry.

UNIT I POLYMER CHEMISTRY 9
Introduction: Functionality-degree of polymerization. Classification of polymers- natural and synthetic, thermoplastic and thermosetting. Types and mechanism of polymerization: addition (free radical, cationic, anionic and living); 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.

UNIT II SURFACE CHEMISTRY AND CATALYSIS 9

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY 9
UNIT IV CHEMICAL THERMODYNAMICS

Second law: Entropy-entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Free energy and work function: Helmholtz and Gibbs free energy functions; Criteria of spontaneity; Gibbs-Helmholtz equation; Clausius Clapeyron equation; Maxwell relations-Van’t Hoff isotherm and isochore. Chemical potential; Gibbs-Duhem equation- variation of chemical potential with temperature and pressure.

UNIT V NANOCHEMISTRY


OUTCOMES:

- Will be familiar with polymer chemistry, surface chemistry and catalysis.
- Will know the photochemistry, spectroscopy and chemical thermodynamics.
- Will know the fundamentals of nano chemistry.

TEXT BOOKS:


REFERENCES:


GE7152 ENGINEERING GRAPHICS

L T P C
3 2 0 4

OBJECTIVES

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

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION)

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.
UNIT I   PLANE CURVES AND FREE HANDSKETCHING

UNIT II   PROJECTION OF POINTS, LINES AND PLANE SURFACES  14
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 trapezoidal 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  14
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to both the principal planes by rotating object method and auxiliary plane method.

UNIT IV   PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES  14
Sectioning of 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  15
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 and vanishing point method.

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY)  3
Introduction to drafting packages and demonstration of their use.

L=45+T=30, TOTAL: 75 PERIODS

OUTCOMES:
On Completion of the course the student will be able to
• Perform free hand sketching of basic geometrical shapes and multiple views of objects.
• Draw orthographic projections of lines, planes and solids
• Obtain development of surfaces.
• Prepare isometric and perspective views of simple solids.

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.

BS7161 BASIC SCIENCES LABORATORY L T P C
(Common to all branches of B.E. / B.Tech Programmes) 0 0 4 2

OBJECTIVE:
- To inculcate experimental skills to test basic understanding of physics of materials including properties of matter, thermal and optical properties.
- To induce the students to familiarize with experimental determination of velocity of ultrasonic waves, band gap determination and viscosity of liquids.

PHYSICS LABORATORY: (Any Seven Experiments)
1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of young’s modulus
3. Uniform bending – Determination of young’s modulus
4. Lee’s disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. a) Optical fibre - Determination of Numerical Aperture and acceptance angle
    b) Compact disc- Determination of width of the groove using laser.
10. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
11. Post office box - Determination of Band gap of a semiconductor.
13. Viscosity of liquids - Determination of co-efficient of viscosity of a liquid by Poiseuille’s flow

TOTAL: 30 PERIODS

OUTCOME:
Upon completion of the course, the students will be able
- To determine various moduli of elasticity and also various thermal and optical properties of materials.
- To determine the velocity of ultrasonic waves, band gap determination and viscosity of liquids.
(CHEMISTRY LABORATORY)  (Minimum of 8 experiments to be conducted)

1. Estimation of HCl using Na₂CO₃ as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler’s method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using photometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10-
   Phenanthroline/thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
12. Pseudo first order kinetics-ester hydrolysis.
14. Determination of CMC.
15. Phase change in a solid.

TOTAL: 30 PERIODS

TEXT BOOKS:
2. Laboratory Manual- Department of Chemistry, CEGC, Anna University 2014.
2. ELECTRICAL ENGINEERING PRACTICES 15
• Basic household wiring using Switches, Fuse, Indicator and Lamp etc.,
• Staircase light wiring
• Tube – light wiring
• Preparation of wiring diagrams for a given situation.
• Study of Iron-Box, Fan Regulator and Emergency Lamp

GROUP – B (MECHANICAL AND ELECTRONICS) 15
3. MECHANICAL ENGINEERING PRACTICES

WELDING
• Arc welding of Butt Joints, Lap Joints, and Tee Joints
• Gas welding Practice.
• Basic Machining - Simple turning, drilling and tapping operations. 
• Study and assembling of the following:
  a. Centrifugal pump
  b. Mixie
  c. Air Conditioner.

DEMONSTRATION ON FOUNDRY OPERATIONS.
4. ELECTRONIC ENGINEERING PRACTICES 15
• Soldering simple electronic circuits and checking continuity.
• Assembling electronic components on a small PCB and Testing.
• Study of Telephone, FM radio and Low Voltage Power supplies.

TOTAL: 60 PERIODS

OUTCOMES:
• Ability to fabricate carpentry components and to lay pipe connections including plumbing works.
• Ability to use welding equipments to join the structures
• Ability to do wiring for electrical connections and to fabricate electronics circuits.

HS7251 TECHNICAL ENGLISH L T P C 4 0 0 4

OBJECTIVES:
• To enable students acquire proficiency in technical communication.
• To enhance their reading and writing skills in a technical context.
• To teach various languages learning strategies needed in a professional environment.

CONTENTS:
UNIT I ANALYTICAL READING 12
Listening- Listening to informal and formal conversations; Speaking – Conversation Skills(opening, turn taking, closing )-explaining how something works-describing technical functions and applications; Reading –Analytical reading, Deductive and inductive reasoning; Writing- vision statement–structuring paragraphs.

UNIT II SUMMARISING 12
Listening- Listening to lectures/ talks on Science & Technology; Speaking –Summarizing/ Oral Reporting, Reading – Reading Scientific and Technical articles; Writing- Extended definition –Lab Reports – Summary writing.

UNIT III DESCRIBING VISUAL MATERIAL 12
Listening- Listening to a panel discussion; Speaking – Speaking at formal situations; Reading – Reading journal articles - Speed reading; Writing-data commentary-describing visual material-writing problem-process- solution-the structure of problem-solution texts- writing critiques.
UNIT IV  WRITING/ E-MAILING THE JOB APPLICATION  
Listening- Listening to/ Viewing model interviews; Speaking –Speaking at different types of interviews – Role play practice (mock interview); Reading – Reading job advertisements and profile of the company concerned; Writing- job application – cover letter – Résumé preparation.

UNIT V  REPORT WRITING  
Listening- Viewing a model group discussion; Speaking –Participating in a discussion - Presentation; Reading– Case study - analyse - evaluate – arrive at a solution; Writing– Recommendations - Types of reports (feasibility report)- designing and reporting surveys- – Report format. - writing discursive essays.

TEACHING METHODS:  
Practice writing  
Conduct model and mock interview and group discussion.  
Use of audio – visual aids to facilitate understanding of various forms of technical communication.  
Interactive sessions.

EVALUATION PATTERN:  
Internals – 50%  
End Semester – 50%  
TOTAL: 60 PERIODS

OUTCOMES:  
- Students will learn the structure and organization of various forms of technical communication.  
- Students will be able to listen and respond to technical content.  
- Students will be able to use different forms of communication in their respective fields.

TEXT BOOK:  

REFERENCES:  
OBJECTIVES:

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- 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 the 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  MATRICES  12

UNIT II  VECTOR CALCULUS  12
Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green’s, Gauss divergence and Stoke’s theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III  ANALYTIC FUNCTION  12
Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by Functions $w = z+c$, $az$, $\frac{1}{z}$, $z^2$ - Bilinear transformation.

UNIT IV  COMPLEX INTEGRATION  12
UNIT V  LAPLACE TRANSFORMS

TOTAL: 60 PERIODS

OUTCOMES:
Upon successful completion of the course, students should be able to:
- Evaluate real and complex integrals using the Cauchy integral formula and the residue Theorem
- Appreciate how complex methods can be used to prove some important theoretical results.
- Evaluate line, surface and volume integrals in simple coordinate systems
- Calculate grad, div and curl in Cartesian and other simple coordinate systems, and establish identities connecting these quantities
- Use Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.

TEXT BOOKS:

REFERENCES:
UNIT II  SKELETAL AND RESPIRATORY SYSTEM  9
Skeletal system: Bone types and functions – Joint - Types of Joint - Cartilage and functions

UNIT III  CIRCULATORY SYSTEM  10

UNIT IV  URINARY AND SPECIAL SENSORY SYSTEM  9

UNIT V  NERVOUS SYSTEM  9

OUTCOMES:
The student will have knowledge to:
• Describe basic structural and functional elements of human body.
• Explain organs and structures involving in system formation and functions.
• Identify all systems in the human body.

TEXT BOOKS:

REFERENCES:

EC7252 ELECTRON DEVICES AND CIRCUITS  L T P C 3 0 0 3

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  9
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 amplifier –Types (Qualitative analysis).

UNIT V FEEDBACK AMPLIFIERS AND OSCILLATORS

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:

GE7151 COMPUTING TECHNIQUES
(Common to all branches of Engineering and Technology) L T P C

OBJECTIVES:
- To learn programming using a structured programming language.
- To provide C programming exposure.
- To introduce foundational concepts of computer programming to students of different branches of Engineering and Technology.

UNIT I INTRODUCTION
Introduction to Computers – Computer Software – Computer Networks and Internet - Need for logical thinking – Problem formulation and development of simple programs - Pseudo code - Flow Chart and Algorithms.

UNIT II C PROGRAMMING BASICS
UNIT III ARRAYS AND STRINGS

UNIT IV POINTERS
Macros - Storage classes –Basic concepts of Pointers– Pointer arithmetic - Example Problems - Basic file operations.

UNIT V FUNCTIONS AND USER DEFINED DATA TYPES

TOTAL :45 PERIODS

OUTCOMES
At the end of the course, the student should be able to:
- Write C program for simple applications
- Formulate algorithm for simple problems
- Analyze different data types and arrays
- Perform simple search and sort.
- Use programming language to solve problems.

TEXTBOOKS:

REFERENCES:

EC7251 CIRCUIT THEORY

OBJECTIVES:
- To introduce the basic concepts of DC and AC circuits behavior
- To study the transient and steady state response of the circuits subjected to step and sinusoidal excitations.
- To introduce different methods of circuit analysis using Network theorems, duality and topology.

UNIT I DC CIRCUIT ANALYSIS
Basic Components of electric Circuits, Charge, current, Voltage and Power, Voltage and Current Sources, Ohms Law, Kirchoff’s Current Law, Kirchoff’s voltage law, The single Node – Pair Circuit, series and Parallel Connected Independent Sources, Resistors in Series and Parallel, voltage and current division, Nodal analysis, Mesh analysis.

UNIT II NETWORK THEOREM AND DUALITY
UNIT III  SINUSOIDAL STEADY STATE ANALYSIS  8+8

UNIT IV  TRANSIENTS AND RESONANCE IN RLC CIRCUITS  6+6

UNIT V  COUPLED CIRCUITS AND TOPOLOGY  6+6
Magnetically Coupled Circuits, mutual Inductance, the Linear Transformer, the Ideal Transformer, An introduction to Network Topology, Trees and General Nodal analysis, Links and Loop analysis.

OUTCOMES:
At the end of the course, the student should be able to:
• Develop the capacity to analyze electrical circuits, apply the circuit theorems in real time
• Design and understand and evaluate the AC and DC circuits.

TEXT BOOKS:

REFERENCES:

EC7261  DEVICES AND CIRCUITS LABORATORY  L T P C 0 0 4 2
OBJECTIVES:
The student should be made to:
• Be exposed to RL and RC circuits
• Be familiar with Thevenin & Norton theorem KVL & KCL, and Super Position Theorems
• Know series and parallel resonance circuits.
• Learn the characteristics of basic electronic devices.
• Understand the characteristics of Amplifiers.

LIST OF EXPERIMENTS
1. Verification of ohm’s law, Kirchhoff’s law, and Thevenin’s theorem
2. Verification of superposition theorem and Maximum power transfer theorem
3. Frequency response of series resonance and parallel resonance circuits
5. PN Junction Diode Characteristics and application as half wave and full wave rectifiers
6. Zener Diode Characteristics and application as voltage regulator
7. FET Characteristics
8. Characteristics of Thyristor and UJT
9. Frequency Response of CE Amplifier
10. Design and Analysis of Feedback Amplifiers
11. Design and Analysis of Differential Amplifier
12. Design of RC Oscillators and LC Oscillators

TOTAL: 60 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Design RL and RC circuits
- Verify Thevenin & Norton theorem KVL & KCL, and Super Position Theorems
- Draw the characteristics of series and parallel resonance circuits.
- Discuss the characteristics of basic electronic devices.
- Describe the characteristics of Amplifiers

GE7161 COMPUTER PRACTICES LABORATORY

OBJECTIVES:
- To understand the basic programming constructs and articulate how they are used to
develop a program with a desired runtime execution flow.
- To articulate where computer programs fit in the provision of computer-based solutions
to real world problems.
- To learn to use user defined data structures.

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
9. Program using Recursive Function
10. Program using structures and unions.

TOTAL: 60 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Write and compile programs using C programs.
- Write program with the concept of Structured Programming
- Identify suitable data structure for solving a problem
- Demonstrate the use of conditional statement.

LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS
30 Systems with C compiler
OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To get a clear idea of biomolecules and their functions.
- To know the significance of biomolecules in biological systems.
- To understand the metabolic pathways in normal and pathological conditions.

UNIT I INTRODUCTION TO BIOCHEMISTRY

Introduction to Biochemistry, water as a biological solvent, weak acid and bases, pH, buffers, Henderson - Hasselbalch equation, physiological buffers, fitness of the aqueous environment for living organism. Principle of viscosity, surface tension, adsorption, diffusion, osmosis and their applications in biological systems.

UNIT II CARBOHYDRATES


UNIT III LIPIDS

Classification of lipids - simple, compound and derived lipids. Nomenclature of fatty acid, physical and chemical properties of fat. Saponification number, Reichert- Meissl number and iodine number. Metabolic pathways: synthesis and degradation of fatty acid (beta oxidation), hormonal regulation of fatty acid metabolism, ketogenesis, structural architecture and significance of biological membrane.

UNIT IV NUCLEIC ACID & PROTEIN


UNIT V ENZYME AND ITS KINETICS


OUTCOMES:

At the end of the course the student is able to

- Comprehend and appreciate the significance and role of this course in the present contemporary world
- Explain about bio molecules such as Carbohydrates, Lipids, Nucleic Acid & Protein and its functions
- Assess the significance of bio molecules in biological systems.
- Analyze the etiology and biological parameters in metabolic diseases.

TEXT BOOKS:

REFERENCES:
2. Pamela.C.Champe and Richard. A. Harvey “Biochemistry Lippincott”s Illustrated Reviews”.

BM7302 SENSORS AND MEASUREMENTS

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To understand the purpose of measurement, the methods of measurements, errors associated with measurements.
- To know the principle of transduction, classifications and the characteristics of different transducers and study its biomedical applications.
- To know the different display and recording devices.

UNIT I SCIENCE OF MEASUREMENT

UNIT II DISPLACEMENT, PRESSURE, TEMPERATURE SENSORS
Resistive Transducers: Strain Gauge: Gauge factor, sensing elements, configuration, biomedical applications; strain gauge as displacement & pressure transducers, RTD materials & range, Characteristics, thermistor characteristics, biomedical applications of Temperature sensors Capacitive transducer, Inductive transducer, LVDT, Active type: Thermocouple – characteristics.

UNIT III PHOTOELECTRIC AND PIEZOELECTRIC SENSORS
Phototube, scintillation counter, Photo Multiplier Tube (PMT), photovoltaic, Photo conductive cells, photo diodes, phototransistor, comparison of photoelectric transducers, spectrophotometric applications of photo electric transducers. Piezoelectric active transducer and biomedical applications as pressure & Ultrasound transducer.

UNIT IV SIGNAL CONDITIONING & SIGNAL ANALYSER

UNIT V DISPLAY AND RECORDING DEVICES
Digital voltmeter – Multi meter – CRO – block diagram, CRT – vertical & horizontal deflection system, DSO, LCD monitor, PMMC writing systems, servo recorders, photographic recorder, magnetic tape recorder, Inkjet recorder, thermal recorder. Demonstration of the display and recording devices.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the student should be able to:
- Comprehend and appreciate the significance and role of this course in the present contemporary world
- Describe the purpose and methods of measurements
- Analyze the characteristics of different transducers
- Explain different display and recording devices for various applications.
TEXT BOOKS:

REFERENCES:

EC7355 SIGNALS AND SYSTEMS L T P C
2 2 0 3

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce visualization and mathematical representation of continuous-time and discrete-time signals
- To teach the applications of Laplace and Fourier transforms in the analysis of continuous-time signals
- To teach the applications of Z- and Fourier transforms in the analysis of discrete – time signals

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 6+6
Continuous time signals (CT signals)- Discrete time signals (DT signals) – Step, Ramp, Pulse, Impulse, Exponential - classification of CT and DT signals – periodic and a periodic signals, random signals, Energy & Power signals - CT systems and DT systems, Classification of systems.

UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS 6+6
Fourier series analysis- Spectrum of Continuous Time (CT) signals- Fourier and Laplace transforms in Signal Analysis.

UNIT III LINEAR TIME INVARIANT–CONTINUOUS TIME SYSTEMS 6+6
Differential Equation-Block diagram representation-impulse response, convolution integrals- Fourier and Laplace transforms in Analysis.

UNIT IV ANALYSIS OF DISCRETE TIME SIGNALS 6+6
Baseband Sampling of CT signals- Aliasing, Reconstruction of CT signal from DT signal DTFT and properties, Z-transform & properties.

UNIT V LINEAR TIME INVARIANT–DISCRETE TIME SYSTEMS 6+6
Difference Equations-Block diagram representation-Impulse response-Convolution sum-DTFT and Z Transform analysis of Recursive & Non-Recursive systems.

TOTAL: 30L + 30T: 60 PERIODS
OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• To compute the spectrum of any signal
• To identify the requirements and use transforms for processing real-world signals
• To analyse and design continuous-time and discrete-time systems

TEXT BOOKS:

REFERENCES:

EE7305 ELECTRICAL ENGINEERING L T P C
3 0 0 3

OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To understand magnetic circuits, principle and application of transformers
• To know the Principle of operation of DC motors and AC Machines

UNIT I INDUCTION THEORY 9
Magnetic effects of electric current- Magnetic circuits- Magnetic materials and B-H relationship-
Energy and co energy– Electromagnetic induction and force – Hysteresis and eddy current losses

UNIT II TRANSFORMER 9

UNIT III DC MACHINES 9
UNIT IV  INDUCTION MACHINES AND SYNCHRONOUS MACHINES


UNIT V  SPECIAL ELECTRIC MACHINES

Switched reluctance motor, stepper motor, servo motor, BL DC motor- working principles, speed-torque characteristics and applications.

OUTCOMES:
At the end of the course, the student should be able to:
- Comprehend and appreciate the significance and role of this course in the present contemporary world
- Describe principles and applications of transformers.
- Explain the working of DC Motors, fractional kW motors, AC machines.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

GE7251  ENVIRONMENTAL SCIENCE AND ENGINEERING  L T P C
3 0 0 3

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

UNIT II ENVIRONMENTAL POLLUTION
Definition – Causes, Effects and Control Measures of: (A) Air Pollution (B) Water Pollution (C) Soil Pollution (D) Marine Pollution (E) Noise Pollution (F) Thermal Pollution (G) Nuclear Hazards – Soil Waste Management: Causes, Effects and Control Measures of Municipal Solid Wastes – Role of an Individual in Prevention of Pollution – Pollution Case Studies – Disaster Management: Floods, Earthquake, Cyclone and Landslides.
Field Study of Local Polluted Site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES
Field Study of Local Area to Document Environmental Assets – River / Forest / Grassland / Hill / Mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

TOTAL: 45 PERIODS

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

MA7358 TRANSFORM TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS

OBJECTIVES:
- To introduce the effective mathematical tools for the solutions of partial differential equations that model physical processes;
- 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 in which the functions used are not periodic;
- To develop Z- transform techniques which will perform the same task for discrete time systems as Laplace Transform, a valuable aid in analysis of continuous time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS

UNIT II FOURIER SERIES

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATION
Method of separation of variables – Solutions of one dimensional wave equation and one-dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions in cartesian coordinates.

UNIT IV FOURIER TRANSFORM

UNIT V Z – TRANSFORM AND DIFFERENCE EQUATIONS

TOTAL: 60 PERIODS
OUTCOME:
- The students can able to solve the partial differential equations, find the Fourier series analysis and solve the problems by using Fourier transform and Z transform techniques.

TEXTBOOKS:

REFERENCES:

BM7311 BIOCHEMISTRY AND HUMAN PHYSIOLOGY
OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To provide practice on
- Estimation and quantification of bio molecules.
- Separation of macromolecules.
- Interpreting the metabolic changes in pathological conditions

LIST OF EXPERIMENTS:
1. Study of Human anatomy with A.D.A.M interactive online software
2. General tests for carbohydrates, proteins and lipids.
3. Preparation of serum and plasma from blood.
4. Estimation of blood glucose.
5. Estimation of creatinine
6. Estimation of urea
7. Estimation of cholesterol
8. Assay of SGOT/SGPT
9. Separation of proteins by SDS electrophoresis
10. Separation of amino acids by thin layer chromatography
11. Separation of DNA by agarose gel electrophoresis
12. ESR, PCV, MCH, MCV, MCHC, total count of RBCs and hemoglobin estimation.
13. Differential count of different WBCs and blood group identification.
15. Ishihara chart for color blindness and Snellen’s chart for myopia and hyperopia - by letters reading and ophthalmoscope to view retina

TOTAL: 60 PERIODS
OUTCOMES:
Upon completion of the course, students will be able to:
- Comprehend and appreciate the significance and role of this course in the present contemporary world
- Use basic laboratory skills and apparatus to obtain reproducible data from biochemical experiments.
- Separate and analyze the importance of macromolecules.
- Discuss the various blood parameters in pathological conditions.
- Analyze, interpret and report the results of the laboratory experiments.
- Implement experimental protocols and adopt to plan and carry out simple investigations.

BM7312  SENSORS AND MEASUREMENTS LABORATORY      L T P C
                                   0 0 4 2
OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study the characteristics of sensors, signal conditioning circuits and display devices

LIST OF EXPERIMENTS:
1. Characteristics of strain guages.
2. Displacement measurement using LVDT.
3. Characteristics of temperature sensor-thermistor
4. Characteristics of temperature sensor -RTD.
5. Characteristics of thermocouple
6. Characteristics of Light sensors-LDR, PhotoDiode, Photo Transistor
8. Wheatstone Bridge and Kelvin's Bridge for Measurement of Resistance.
11. Study of Medical Oscilloscope.

OUTCOMES:
- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Students are able to design a measurement system for various applications

BM7401  ANALOG AND DIGITAL COMMUNICATION      L T P C
                                   3 0 0 3
OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study the various analog and digital modulation techniques
• To study the principles behind information theory and coding
• To study the various digital communication techniques

UNIT I  ANALOG MODULATION  9

UNIT II  PULSE MODULATION  9
Low pass sampling theorem – Quantization – PAM – Line coding – PCM, DPCM, DM, and ADPCM And ADM, Channel Vocoder - Time Division Multiplexing, Frequency Division Multiplexing

UNIT III  DIGITAL MODULATION AND TRANSMISSION  9
Phase shift keying – BPSK, DPSK, QPSK – Principles of M-ary signaling M-ary PSK & QAM – Comparison, ISI – Pulse shaping – Duo binary encoding – Cosine filters – Eye pattern, equalizers

UNIT IV  INFORMATION THEORY AND CODING  9
Measure of information – Entropy – Source coding theorem – Shannon–Fano coding, Huffman Coding, LZ Coding – Channel capacity – Shannon-Hartley law – Shannon's limit – Error control codes – Cyclic codes, Syndrome calculation – Convolution Coding, Sequential and Viterbi decoding

UNIT V  SPREAD SPECTRUM AND MULTIPLE ACCESS  9
PN sequences – properties – m-sequence – DSSS – Processing gain, Jamming – FHSS – Synchronisation and tracking – Multiple Access – FDMA, TDMA, CDMA,

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• Apply analog and digital communication techniques.
• Use data and pulse communication techniques.
• Analyze Source and Error control coding.

TEXT BOOKS:
2. S. Haykin “Digital Communications” John Wiley 2005

REFERENCES:
OBJECTIVES:
The student should be made to:
- Introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- Study the basic theory of Bio potential Electrodes and Bio potential measurement.
- Understand the design of Bio potential amplifiers.
- Study the various non-electrical physiological measurement and bio chemical measurements.

UNIT I  BIOPOTENTIAL ELECTRODES  9

UNIT II  BIOPOTENTIAL MEASUREMENT  9
Biosignal characteristics– frequency and amplitude ranges. ECG – Einthoven’s triangle, standard 12 lead system. EEG – 10-20 electrode system, unipolar, bipolar and average mode, Functional block diagram. EMG – unipolar and bipolar mode, block diagram.

UNIT III  BIOPOTENTIAL AMPLIFIER  8

UNIT IV  NON ELECTRICAL PHYSIOLOGICAL PARAMETER MEASUREMENT  10

UNIT V  BIOCHEMICAL MEASUREMENT  9
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:
- Comprehend and appreciate the significance and role of this course in the present contemporary world
- Describe the fundamentals of Bio potential recording.
- Design various bio amplifiers.
- Measure various physiological and bio chemical parameters.

TEXT BOOKS:
REFERENCES:

BM7403 CONTROL SYSTEM FOR BIO MEDICAL ENGINEERING L T P C 3 0 0 3

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study the mathematical techniques for analysis of given system
- To study the given system in time domain and frequency domain analysis.
- To study the stability analysis of the given system
- To study the concept of physiological control system

UNIT I CONTROL SYSTEM MODELING 9
Terminology and basic structure of control system, example of a closed loop system, transfer function, modeling of electrical systems, translational and rotational mechanical systems, and electromechanical systems, block diagram and signal flow graph representation of systems, reduction of block diagram and signal flow graph, conversion of block diagram to signal flow graph. Need for modeling physiological system.

UNIT II TIME RESPONSE ANALYSIS 9
Step and impulse responses of first order and second order systems, determination of time domain specifications of first and second order systems from its output responses, definition of steady state error constants and its computations.

UNIT III STABILITY ANALYSIS 9
Definition of stability, Routh- Hurwitz criteria of stability, root locus technique, construction of root locus and study of stability, definition of dominant poles and relative stability.

UNIT IV FREQUENCY RESPONSE ANALYSIS 9
Frequency response, Nyquist stability criterion, Nyquist plot and determination of closed loop stability, definition of gain margin and phase margin, Bode plot, determination of gain margin and phase margin using Bode plot, use of Nichol’s chart to compute frequency and bandwidth.

UNIT V PHYSIOLOGICAL CONTROL SYSTEM 9
Example of physiological control system, difference between engineering and physiological control systems, generalized system properties, models with combination of system elements, linear models of physiological systems-Examples, introduction to simulation. Illustration with real time applications.

TOTAL: 45 PERIODS.
OUTCOMES:
The students will be able to:

- Comprehend and appreciate the significance and role of this course in the present contemporary world
- Develop mathematical model and perform stability analysis.
- Analyze the different systems in time and frequency domain.
- Explain the concept of physiological control systems

TEXT BOOKS:

REFERENCES:

EC7353 DIGITAL ELECTRONICS AND SYSTEM DESIGN

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce Boolean algebra and its applications in digital systems
- To introduce the design of various combinational digital circuits using logic gates
- To bring out the analysis and design procedures for synchronous and asynchronous Sequential circuits
- To introduce the electronic circuits involved in the making of logic gates
- To introduce semiconductor memories and related technology

UNIT I BASIC CONCEPTS AND COMBINATIONAL CIRCUITS
Number Systems – Decimal, Binary, Octal, Hexadecimal, 1's and 2's 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.

UNIT II MSI CIRCUITS
Problem formulation and design of combinational circuits - Code-Converters, Half and Full Adders, Binary Parallel Adder – Carry lookahead Adder, BCD Adder, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Mux/Demux, Case study: Digital transreceiver / 8 bit Arithmetic and logic unit
UNIT III  SYNCRONOUS SEQUENTIAL CIRCUITS  9
Flip flops – SR, JK, T, D, Master/Slave FF, Triggering of FF, Analysis and design of clocked sequential circuits – Design - Moore/Mealy models, state minimization, state assignment, circuit implementation - Counters, Ripple Counters, Ring Counters, Shift registers, Universal Shift Register. Model Development: Designing of rolling display/real time clock

UNIT III  ASYNHRONOUS SEQUENTIAL CIRCUITS  9
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 PROGRAMMABLE LOGIC DEVICES  9
Logic families- TTL, MOS, CMOS, BiCMOS - Comparison of Logic families - Implementation of combinational logic/sequential logic design using standard ICs, ROM, PLA and PAL.

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• Use Boolean algebra and apply it to digital systems.
• Design various combinational digital circuits using logic gates.
• Bring out the analysis and design procedures for synchronous and asynchronous sequential circuits.
• Use electronic circuits involved in the design of logic gates.
• Ability to use the semiconductor memories and related technology.

TEXT BOOKS:

REFERENCES:

EC7452  OPERATIONAL AMPLIFIERS AND ANALOG INTEGRATED CIRCUITS  L T P C
3 0 0 3

OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To study the circuit configuration of linear integrated circuits.
• To introduce practical applications of linear integrated circuits.
• To introduce the concept of analog multiplier and Phase Locked Loop with applications.
• To study the application of ADC and DAC in real time systems.
• To introduce special function ICs and its construction.

UNIT I  CIRCUIT CONFIGURATION FOR LINEAR ICS  9
Current sources, Analysis of difference amplifiers with active loads, supply and temperature independent biasing, Band gap references, Monolithic IC operational amplifiers, specifications, frequency compensation, slew rate and methods of improving slew rate. Interpretation of TL082 datasheet.
UNIT II APPLICATION OF OPERATIONAL AMPLIFIERS
Linear and Nonlinear Circuits using operational amplifiers and their analysis, Inverting and Noninverting Amplifiers, Differentiator, Integrator, Voltage to Currency converter, Instrumentation amplifier, Sine wave Oscillators, Low pass and band pass filters, Comparator, Multivibrator and Schmitt trigger, Triangle wave generator, Precision rectifier, Log and Antilog amplifiers, Non-linear function generator.

UNIT III ANALOG MULTIPLIER AND PLL
Analysis of four quadrants and variable Transconductance multipliers, Analog multiplier MPY634 features, Voltage controlled oscillator, Closed loop analysis of PLL, AM, PM and FSK modulators and demodulators, AVC using op-AMP, Frequency synthesizers, Compander ICs.

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTORS
Analog switches, High speed sample and hold circuit and IC’s, Types of D/A converter, Current driven DAC, Switches for DAC, A/D converter - Flash, Single slope, Dual slope, Successive approximation, DM and ADM, Voltage to Time and Voltage to Frequency converters.

UNIT V SPECIAL FUNCTION ICs
Timers, Voltage regulators - linear and switched mode types, Switched capacitor filter, SMPS, Features of TPS40200, TPS40210 buck and boost controller, Frequency to Voltage converters, Tuned amplifiers, Power amplifiers and Isolation Amplifiers, Video amplifiers, Fiber optics ICs and Opto couplers, Sources for Noises, Op Amp noise analysis and Low noise OP-Amps.

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• Ability to design new analog linear circuits
• Ability to analyze and develop linear IC based Systems.
• Ability to select appropriate IC’s and circuit for analog system design.

TEXT BOOK:

REFERENCES:
OBJECTIVES:

- To provide the necessary basic concepts in probability and random processes and apply them in random signals, linear systems etc. in communications engineering.
- The students will have an exposure of various distributions.

UNIT I RANDOM VARIABLES 12
Discrete and Continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions - Functions of a random variable.

UNIT II TWO-DIMENSIONAL RANDOM VARIABLES 12
Joint distributions – Marginal and Conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III RANDOM PROCESSES 12
Classification – Stationary process – Markov process - Poisson process – Random telegraph process.

UNIT IV CORRELATION AND SPECTRAL DENSITIES 12

UNIT V LINEAR SYSTEMS WITH RANDOM INPUTS 12
Linear time invariant system – System transfer function – Linear systems with random inputs – Auto-correlation and Cross-correlation functions of input and output – White noise.

OUTCOMES:

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

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study and design Bio amplifiers.
- To provide hands on training on Measurement of physiological parameters.

LIST OF EXPERIMENTS:
1. Design of low noise pre-amplifier.
2. Design of ECG amplifier.
3. Design of EMG amplifier.
4. Measurement of heart sounds using PCG.
5. Study of effect of offset potential in Bio potential recording.
8. Measurement of respiration rate.
12. Study of characteristics of optical Isolation amplifiers.

TOTAL: 60 PERIODS.

OUTCOMES:
Students are able to:
- Comprehend and appreciate the significance and role of this course in the present contemporary world
- Design the amplifier for Bio signal measurements
- Record and analyse physiological parameters

OBJECTIVES:
- To Introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To design digital logic and circuits
- To learn the function of different ICs
- To understand the applications of operation amplifier.
- To learn the working of multivibrators
- To design circuits for generating waveforms using ICs.

LIST OF EXPERIMENTS:
1. Inverting, non-inverting amplifier and comparator
2. Integrator and Differentiator
3. Active filter – first order and second order LPF and HPF
4. Schmitt trigger using operational amplifier
5. Instrumentation amplifier using operational amplifier
6. RC and LC oscillators
7. Multivibrators using IC555 Timer
8. Study of logic gates, Half adder and Full adder
9. Encoder and BCD to 7 segment decoder
10. Multiplexer and demultiplexer using digital ICs
11. Universal shift register using flipflops
12. Design of mod-N counter

TOTAL: 60 PERIODS

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

- Comprehend and appreciate the significance and role of this course in the present contemporary world
- Design Circuits using logic gates
- Design and implement circuits for different applications using opamp
- Design oscillators and wave form generators

BM7501 DIAGNOSTIC AND THERAPEUTIC EQUIPMENT - I

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To understand the medical devices applied in measurement of parameters related to cardiology, neurology and the methods of continuous monitoring and transmitting them.
- To learn some of the cardiac assist devices.
- To learn to measure the signals generated by muscles.
- To understand the need and use of some of the extracorporeal devices.

UNIT I CARDIAC EQUIPMENT

UNIT II NEUROLOGICAL EQUIPMENT
Multi channel EEG recording system, Clinical significance of EEG- Epilepsy, Evoked Potential – Visual, Auditory and Somatosensory, EEG Bio Feedback Instrumentation, MEG (Magneto Encephalo Graph) -sensing principle and instrumentation (Block diagram)

UNIT III SKELETAL MUSCULAR EQUIPMENT
Generation of EMG, recording and analysis of EMG waveforms, fatigue characteristics, Muscle stimulators, nerve stimulators, Nerve conduction velocity measurement, EMG Bio Feedback Instrumentation.

UNIT IV PATIENT MONITORING AND BIOTELEMETRY
Patient monitoring systems, ICU/CCU Equipments, Infusion pumps, bed side monitors, Central consoling controls. Radio Telemetry (single, multi), Portable and Landline Telemetry unit, Applications in ECG and EEG Transmission.

UNIT V EXTRA CORPOREAL DEVICES AND SPECIAL DIAGNOSTIC TECHNIQUES

TOTAL: 45 PERIODS
OUTCOMES:
At the end of the course, the student should be able to:
- Comprehend and appreciate the significance and role of this course in the present contemporary world
- Apply different medical devices in the measurement of parameters related to cardiology, neurology
- Explain about cardiac assist devices, its continuous monitoring and transmission
- Measure and analyse signals generated by muscles

TEXT BOOKS:

REFERENCES:

BM7502 HOSPITAL MANAGEMENT L T P C 3 0 0 3

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- The student should be made to understand the principles, practices and areas of application in Hospital management.

UNIT I OVERVIEW OF HOSPITAL ADMINISTRATION 7
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
UNIT IV HOSPITAL INFORMATION SYSTEMS & SUPPORTIVE SERVICES

UNIT V QUALITY AND SAFETY ASPECTS IN HOSPITAL

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Comprehend and appreciate the significance and role of this course in the present contemporary world
- Explain the principles, practices and areas of application in Hospital Management

TEXT BOOKS:

REFERENCES:

EC7352 DATA STRUCTURES AND OBJECT ORIENTED L T P C 3 2 0 4

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- This course comprehends the fundamentals of object oriented programming, particularly in C++, which are then used to implement data structures. This also gives an idea of linear and non-linear data structures and their applications.

UNIT I DATA ABSTRACTION & OVERLOADING 9+6
UNIT II INHERITANCE & POLYMORPHISM  9+6
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  11+6
Asymptotic Notations: Big-Oh, Omega and Theta – Best, Worst and Average case Analysis: Definition and an example – Arrays and its representations – Stacks and Queues – Linked lists – Linked list based implementation of Stacks and Queues – Evaluation of Expressions – Linked list based polynomial addition.

UNIT IV NON-LINEAR DATA STRUCTURES  9+6

UNIT V SORTING & SEARCHING  7+6
Insertion sort – Merge sort – Quick sort – Heap sort – Linear Search – Binary Search.

TOTAL: 45 L+30 T = 75 PERIODS

OUTCOMES:
- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Select suitable data structure for specific Application.
- Compare Linear and nonlinear data structures for different application.
- Perform different searching and sorting techniques.
- Identify connected components in trees.
- Analyze asymptotic notations

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To study the architecture of 8085, 8086 and 8051
• To study the addressing modes and instruction set of 8085, 8086 and 8051
• To introduce the need and use of interrupt structure in 8085 and 8051.
• To develop skill in simple program writing for 8085 and 8051 applications.
• To introduce commonly used peripheral / interfacing ICs.

UNIT I 8- BIT MICROPROCESSOR.
8085 Architecture, Pin configuration, Instruction set, Addressing modes, Interrupts, Timing diagrams Memory and I/O interfacing.

UNIT II 16- BIT MICROPROCESSOR.

UNIT III PERIPHERALS AND INTERFACING
Programmable Peripheral Interface (8255), Keyboard display controller (8279), ADC0808 and DAC0808 Interface, Programmable Timer Controller (8254), Programmable interrupt controller (8259), Serial Communication Interface (8251).

UNIT IV MICROCONTROLLER
8051 – Architecture, Special Function Registers (SFRs), Instruction set, Addressing modes, Assembly language programming, I/O Ports, Timers / counters, Interrupts and serial communication.

UNIT V MICROCONTROLLER BASED SYSTEM DESIGN.
Interfacing to: matrix display, (16x2) LCD, high power devices, optical motor shaft encoder, Stepper Motor, DC Motor speed Control using PWM, RTC and EEPROM interface using I2C protocol.

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• Ability to design and develop microprocessor architecture.
• Ability to develop microprocessor and microcontroller systems for entertainment, communication and medical applications.
• Ability to troubleshoot microprocessor and microcontroller systems.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To understand computation of spectrum and to analyze systems
• To understand filters for spectrum shaping
• To understand implementation issues in a Digital Signal Processor

UNIT I  DISCRETE FOURIER TRANSFORM  9

UNIT II  DESIGN OF INFINITE IMPULSE RESPONSE FILTERS  9
Analog filters – Butterworth filters, Chebyshev Type I filters (upto 3rd order), Analog Transformation of prototype LPF to BPF /BSF/ HPF. Transformation of analog filters into equivalent digital filters using Impulse invariant method and Bilinear Z transform method - Realization structures for IIR filters – direct, cascade, parallel forms.

UNIT III  DESIGN OF FINITE IMPULSE RESPONSE FILTERS  9
Design of linear phase FIR filters windowing and Frequency sampling methods - Realization structures for FIR filters – Transversal and Linear phase structures, Comparison of FIR & IIR.

UNIT IV  FINITE WORDLENGTH EFFECTS  9
Representation of numbers-ADC Quantization noise-Coefficient Quantization error, Product Quantization error-truncation & rounding errors -Limit cycle due to product round-off error- Round-off noise power

UNIT V  INTRODUCTION TO DIGITAL SIGNAL PROCESSORS  9
DSP functionalities - circular buffering – DSP architecture – Fixed and Floating point architecture principles – Programming – Application examples.

TOTAL: 45 PERIODS

OUTCOMES:

• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• Design systems using spectrum information
• Hardware design and implementation of digital signal processing systems

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues.
- To study introduce the programming language of 8085, 8086 and 805.
- To develop skill in program writing for microprocessors and controllers.
- To introduce microprocessor and microcontroller based system design.
- To impart knowledge on embedded S/W development.

8085 based experiments:
1. Assembly Language Programming of 8085.

8086 based experiments:
2. Programs for 16 bit Arithmetic, Sorting, Searching and String operations,
3. Programs for Digital clock, Interfacing ADC and DAC
4. Interfacing and programming 8279, 8259, and 8253.
5. Serial Communication between two microprocessors kits using 8251.
6. Interfacing Stepper Motor, Speed control of DC Motor
7. Parallel communication between two microprocessors kits using Mode 1 and Mode 2 of 8255.
8. Macro assembler Programming for 8086

8051 based experiments using assembly language and C programming:
9. Programming using Arithmetic, Logical and Bit Manipulation instructions of the 8051 microcontroller.
11. Interfacing – DAC and ADC and 8051 based temperature measurement
12. Interfacing – LED and LCD
13. Interfacing – Stepper motor and traffic light control system
14. Communication between 8051 Microcontroller kit and PC.

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world.
- Ability to design and develop microprocessor based system for real time application.
- Ability to develop microprocessor and microcontroller systems for entertainment, communication and medical applications.
- Ability to troubleshoot microprocessor and microcontroller systems.

TOTAL: 60 PERIODS

OBJECTIVES:

- 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

DSP Processor Implementation
1. Study of architecture of Digital Signal Processor
2. MAC operation using various addressing modes
3. Implementation of difference equations
4. Linear Convolution
5. Circular Convolution
6. Waveform generation

MATLAB / Equivalent Software package
7. Generation of sequences
8. Linear and Circular Convolutions
9. DFT
10. FIR filter design
11. IIR filter design
12. Decimation and Interpolation

TOTAL: 60 PERIODS

OUTCOMES:
- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- 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

BM7601  BIOMECHANICS  L T P C  3 0 0 3

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study about the mechanics involved with various physiological systems.
- To gain knowledge in deriving the mathematical models related to blood vessels.

UNIT I  INTRODUCTION  9

UNIT II  MECHANICS OF PHYSIOLOGICAL SYSTEMS  9
Heart valves, power developed by the heart, prosthetic valves. Constitutive equations for soft tissues, dynamics of fluid flow in cardiovascular system and effect of vibration - shear stresses in extra-corporeal circuits.

UNIT III  ORTHOPAEDIC MECHANICS  9
Mechanical properties of cartilage, diffusion properties of articular cartilage, mechanical properties of bone, kinetics and kinematics of joints, Lubrication of joints.

UNIT IV  MATHEMATICAL MODELS  9
Introduction to Finite Element Analysis, Mathematical models - pulse wave velocities in arteries, determination of in-vivo elasticity of blood vessel, dynamics of fluid filled catheters.

UNIT V  ORTHOPAEDIC APPLICATIONS  9

TOTAL: 45 PERIODS
OUTCOMES:
At the end of the course, the student should be able to:
- Comprehend and appreciate the significance and role of this course in the present contemporary world
- Explain the mechanics of physiological systems.
- Analyze the biomechanical systems.
- Design orthopedic applications.

TEXT BOOKS:

REFERENCES:

BM7602 DIAGNOSTIC AND THERAPEUTIC EQUIPMENT - II L T P C 3 0 0 3

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues

The student should be made to:
- Gain knowledge about measurements of parameters related to respiratory system
- Learn measurement techniques of sensory responses
- Understand different types and uses of diathermy units.
- Know ultrasound imaging technique and its use in diagnosis
- Know the importance of patient safety against electrical hazard

UNIT I RESPIRATORY MEASUREMENT SYSTEM 10

UNIT II SENSORY MEASUREMENT 8
Psycho Physiological Measurements-for testing sensory Responses, Electro occulograph, Electro retinograph, Audiometer-Pure tone, Speech. EGG (Electrogastrograph), galvanic skin resistance (GSR), polygraph.
UNIT III DIATHERMY

IR and UV lamp - application. Need for different diathermy units, Short wave diathermy, ultrasonic diathermy, Microwave diathermy. Electro surgery machine - Current waveforms, Tissue Responses, Electro surgical current level, Hazards and safety procedures.

UNIT IV ULTRASONIC TECHNIQUE

Diagnosis: Tissue Reaction, Basic principles of Echo technique, display techniques A, B and M mode, B Scan, Application of ultrasound as diagnostic tool – Echocardiogram, Echoencephalogram, abdomen, obstetrics and gynecology, ophthalmology.

UNIT V PATIENT SAFETY


OUTCOMES:

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

- Comprehend and appreciate the significance and role of this course in the present contemporary world
- Explain about measurements of parameters related to respiratory system and sensory responses
- Analyze different types of diathermy units and ultrasound scanner
- Identify the electrical hazards
- Implement methods of patient safety

TEXT BOOKS:


REFERENCES:

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues.
- To understand the structural and functional aspects of living organisms.
- To know the etiology and remedy in treating the pathological diseases.
- To empower the importance of public health.

UNIT I  CELL DEGENERATION, REPAIR AND NEOPLASIA  9
Cell injury and Necrosis, Apoptosis, Intracellular accumulations, Pathological calcification, cellular adaptations of growth and differentiation, Inflammation and Repair including fracture healing, Neoplasia, Classification, Benign and Malignant tumours, carcinogenesis, spread of tumours. Autopsy and biopsy.

UNIT II  FLUID AND HEMODYNAMIC DERRANGEMENTS  9

UNIT III  MICROSCOPES  9

UNIT IV  MICROBIAL CULTURES  9
Morphological features and structural organization of bacteria, growth curve, Sterilization techniques – physical and chemical methods, identification of bacteria, culture media and its types, culture techniques and observation of culture.

UNIT V  IMMUNOLOGY  9
Natural and artificial immunity, opsonization, phagocytosis, inflammation, Immune deficiency syndrome, antibodies and its types, antigen and antibody reactions, immunological techniques: immunodiffusion, immuno electrophoresis, radioimmunoassay and enzyme linked immune sorbent assay, monoclonal antibodies. Disease caused by bacteria, fungi, protozoal, virus and helminthes.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Comprehend and appreciate the significance and role of this course in the present contemporary world.
- Analyze structural and functional aspects of living organisms.
- Explain the function of microscopes.
- Discuss on the importance of public health.
- Describe treatment methods involved in curing the pathological diseases.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To understand generation of x-rays and its applications in imaging.
- To learn different types of radio diagnostic techniques.
- To know techniques used for visualizing different sections of the body
- To learn radiation therapy methodologies and the radiation safety.

UNIT I  MEDICAL X-RAY EQUIPMENT


UNIT II  COMPUTED TOMOGRAPHY


UNIT III  MAGNETIC RESONANCE IMAGING

Fundamentals of magnetic resonance- Interaction of Nuclei with static magnetic field and Radiofrequency wave- rotation and precession – Induction of magnetic resonance signals – bulk Magnetization – Relaxation processes T1 and T2. Block Diagram approach of MRI system- system Magnet (Permanent, Electromagnet and Super conductors), generations of gradient magnetic fields, Radio Frequency coils (sending and receiving), shim coils, Electronic components, fMRI.

UNIT IV  NUCLEAR MEDICINE SYSTEM


UNIT V  RADIATION THERAPY AND RADIATION SAFETY


TOTAL: 45 PERIODS.

OUTCOMES:

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

- Comprehend and appreciate the significance and role of this course in the present contemporary world
- Describe the different types of medical imaging techniques.
- Explain the principle of Radio therapy techniques.

TEXT BOOKS:

REFERENCES:

BM7611 DIAGNOSTIC AND THERAPEUTIC EQUIPMENT LABORATORY
L T P C
0 0 4 2

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To provide practice on recording and analysis of different Bio potentials
- Study the function of different therapeutic equipments.

LIST OF EXPERIMENTS:
1. Recording and analysis of ECG signals
2. Recording and analysis of EEG signals.
3. Recording and analysis of EMG signal and plotting of fatigue characteristics.
4. Simulation of ECG – detection of QRS complex and heart rate
5. Study of shortwave and ultrasonic diathermy
6. Study of Patient Monitoring System
7. Study of biotelemetry
8. Electrical safety measurements.
11. Measurement of GSR.
12. Recording of Audiogram.

OUTCOMES:
At the end of the course, the student should be able to:
- Comprehend and appreciate the significance and role of this course in the present contemporary world
- Record and Analyse physiological signal
- Describe the functional characteristics of therapeutic equipment
- Test the safety of medical equipment
OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientists, national/international policies with a futuristic vision along with socio-economic impact and issues.
- The student should be made to use Compound microscope
- To practice on chemical examinations, Cryoprocessing, Histopathological examinations etc

LIST OF EXPERIMENTS:
1. Study of parts of compound microscope & Fluorescent Microscope
2. Histopathological slides of benign and malignant tumours.
3. Manual paraffin tissue processing and section cutting (demonstration)
4. Cryo processing of tissue and cryosectioning (demonstration)
5. Basic staining – Hematoxylin and eosin staining.
6. Viability staining studies using Trypan blue and Fluorescent staining
7. Simple stain.
8. Gram stain.
9. AFB stain.
10. Slides of malarial parasites, microfilaria and leishmania donovani.
11. Haematology slides of anemia and leukemia.
12. Study of bone marrow charts.
13. Bleeding time and clotting time.

TOTAL : 60 PERIODS.

OUTCOMES:
Students should be capable of
- Comprehend and appreciate the significance and role of this course in the present contemporary world
- Using compound microscopes
- Perform practical experiments on tissue processing, cryoprocessing and staining processes.

UNIT I
- Medical Informatics – Bioinformatics – Health Informatics - Structure of Medical Informatics – Functional capabilities of Hospital Information System - On-line services and Off-line services - History taking by computer, Dialogue with the computer
UNIT II MEDICAL STANDARDS 9

UNIT III MEDICAL DATA STORAGE AND AUTOMATION 9
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 , Data mining.

UNIT IV HEALTH INFORMATICS 9
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 9
Medical Expert Systems, Virtual reality applications in medicine, Virtual Environment - Surgical simulation - Radiation therapy and planning – Telemedicine – virtual Hospitals - Smart Medical Homes – Personalized e-health services – Biometrics - GRID and Cloud Computing in Medicine

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Discuss about health informatics and different ICT applications in medicine.
- Explain the function of Hospital Information Systems
- Analyze medical standards

TEXT BOOKS:

REFERENCES:

BM7702 PATTERN RECOGNITION AND NEURAL NETWORKS L T P C 3 0 0 3
OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study the fundamentals of pattern recognition and its application.
- To learn algorithms suitable for pattern classification.
- To understand applications of pattern recognition and classification in image processing and computer vision.
UNIT I INTRODUCTION AND SUPERVISED LEARNING
Overview of Pattern recognition, Relevance to the field, Types of Pattern recognition, Parametric and Nonparametric approach, Bayesian classifier, Discriminant function, non-parametric density estimation, histograms, kernels, window estimators, k-nearest neighbor classifier, estimation of error rates.

UNIT II UNSUPERVISED LEARNING AND CLUSTERING ANALYSIS

UNIT III INTRODUCTION AND SIMPLE NEURAL NET
Elementary neurophysiology and biological neural network – Artificial neural network – Architecture, biases and thresholds, Hebb net, Perceptron, Adaline and Madaline.

UNIT IV BACK PROPAGATION AND ASSOCIATIVE MEMORY
Back propagation network, generalized delta rule, Bidirectional Associative memory Hopfield Network

UNIT V NEURAL NETWORKS BASED ON COMPETITION
Kohonen Self organizing map, Learning Vector Quantisation, Counter Propagation network, Case studies.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Comprehend and appreciate the significance and role of this course in the present contemporary world
- Explain the fundamentals of pattern recognition and neural networks.
- Design and apply different pattern recognition techniques.

TEXT BOOKS:

REFERENCES:

EC7751 PRINCIPLES OF DIGITAL IMAGE PROCESSING

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study the formation of an image and its acquisition
- To introduce the use and application of transforms in image processing
- To study techniques for improving quality of information in spoilt images
- To introduce schemes for compressing images to save storage space
UNIT I  DIGITAL IMAGE FUNDAMENTALS  
Elements of digital image processing systems, Vidicon and Digital Camera working principles, - Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, Color image fundamentals - RGB, HSI models, Image sampling, Quantization, dither, Two- dimensional mathematical preliminaries, 2D transforms - DFT, DCT, KLT, SVD.

UNIT II  IMAGE ENHANCEMENT  
Point processing, Histograms, Histogram equalization and specification techniques, Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contraharmonic mean filters, Homomorphic filtering, Color image enhancement.

UNIT III  IMAGE RESTORATION  

UNIT IV  IMAGE SEGMENTATION  
Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and Merging – Segmentation by morphological watersheds – Hybrid methods

UNIT V  IMAGE COMPRESSION  
Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, MPEG.

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• To utilize appropriate preprocessing techniques for manipulation of images
• To design automated techniques for image based applications

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study the various aspects of image processing techniques for medical images

LIST OF EXPERIMENTS:
1. Display of Grayscale Images.
2. Histogram Equalization.
3. Spatial filtering
5. Edge detection using Operators.
6. 2-D DFT and DCT.
7. Filtering in frequency domain.
8. Display of color images.
10. DWT of images.
11. Segmentation using watershed transform.
12. Study of DICOM standards.
13. Stenography
14. Medical Image Compression techniques.
15. Medical image fusion

TOTAL: 60 PERIODS

OUTCOMES:
- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world

At the end of the course the student will be able to apply analysis and processing techniques to medical images.

REFERENCE:

UNIT I ANALYTICAL TECHNIQUES
Principle, instrumentation and application of electrophoresis- SDS, native gel. UV and IR spectroscopy and its application. Spectrophotometry, fluorimetry. NMR – principle, instrumentation and application in medical sciences.
UNIT II ENZYMES AS A DIAGNOSTIC TOOL

UNIT III RADIOISOTOPIC TECHNIQUES
Types of radioisotopes, units of measurements, methods in measuring radioactivity –G.M liquid scintillation counter application in diagnosis (RIA & ELISA) , autoradiography, biological hazards, safety measures in handling isotopes, disposal of labeled compounds and radiodosimetry

UNIT IV GENE THERAPY

UNIT V NANTHERAPEUTICS
Nanoparticles as carriers in drug delivery- design, manufacture and Physiochemical properties, transport across biological barriers, nanotechnology in Cancer therapy, bone treatment, nano particles for oral vaccination and skin disease. Types of nanoparticles-half life. Fate of nano particles.

TOTAL:45PERIODS

OUTCOMES:
At the end of course, the student should be able to:
- Comprehend and appreciate the significance and role of this course in the present contemporary world
- Report and discuss on chemical analytical aspects relevant for the selection of proper analytical techniques.
- Implement bio analytical aspects in medical sciences.

TEXT BOOKS:

REFERENCES:
1. Trevor Palmer, "Understanding Enzymes", Published by Ellis Horwood LTD, 4rd edition, 1995
OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study the characteristics of different biosignals
- To learn linear and non-linear filtering techniques to extract desired information
- To understand various techniques for automated classification and decision making to aid diagnosis

UNIT I    BIOSIGNAL AND SPECTRAL CHARACTERISTICS

UNIT II    TIME SERIES ANALYSIS AND SPECTRAL ESTIMATION
Time series analysis – linear prediction models, process order estimation, lattice representation, non stationary process, fixed segmentation, adaptive segmentation, application in EEG, PCG signals, Time varying analysis of Heart-rate variability, model based ECG simulator. Spectral estimation –Blackman Tukey method, periodogram, and model based estimation. Application in Heart rate variability, PCG signals.

UNIT III    ADAPTIVE FILTERING AND WAVELET DETECTION
Filtering – LMS adaptive filter, adaptive noise canceling in ECG, improved adaptive filtering in ECG, Wavelet detection in ECG – structural features, matched filtering, adaptive wavelet detection, detection of overlapping wavelets.

UNIT IV    BIOSIGNAL CLASSIFICATION AND RECOGNITION

UNIT V    TIME FREQUENCY AND MULTIVARIATE ANALYSIS
Time frequency representation, spectrogram, Wigner distribution, Time-scale representation, scalogram, wavelet analysis – Data reduction techniques, ECG data compression, ECG characterization, Feature extraction- Wavelet packets, Multivariate component analysis-PCA,ICA

OUTCOMES:
Upon the completion of this course, the students should able to:
- Comprehend and appreciate the significance and role of this course in the present contemporary world
- Analyze biosignals in time domain & to estimate the spectrum.
- Apply wavelet detection techniques for biosignal processing.
- Extract the features using multivariate component analysis.

TEXT BOOKS:
REFERENCES:

BM7003 BIO MATERIALS AND ARTIFICIAL ORGANS L T P C 3 0 0 3

OBJECTIVES:
- To study the characteristics and classification of biomaterials.
- To understand the response of biomaterials in living system.
- To learn about the polymeric materials and composites in tissue replacements.
- To know the compatibility and functioning of artificial organs inside the living system.

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, HLA 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. Soft-tissue replacements, types of transplant by stem cell, 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. Total: 45 PERIODS
OUTCOMES:
At the end of the course, the student will able to:
- Analyze different types of materials and apply in designing a device.
- Choose materials for design of implants in tissue replacement.

TEXT BOOKS:

REFERENCES:

BM7004 BIOMATERIALS AND CHARACTERISATION

OBJECTIVES:
- To study the characteristic features of bio materials in medicine.
- To know biocompatibility and functionality of biomaterials and implement in living system.

UNIT I BIOMATERIALS AND PROPERTIES
Biomaterials: Introduction to biomaterials and requirements of biomaterials, Classification of biomaterials: Metallic, Ceramic, Polymeric and biological biomaterials. Properties of biomaterials: Bulk properties and Surface properties, ethics.

UNIT II BIOMATERIALS IN MEDICINE

UNIT III PHYSIO-CHEMICAL CHARACTERIZATION
Material Characterization: X-ray Diffraction Analysis (XRD), X-ray absorption, level of exposure and limitations, FT- Raman and micro Raman analysis, Electron Spectroscopy for Chemical Analysis (ESCA) and X-ray Photo electron Spectroscopy (XPS), mechanical testing: tensile, compression, wears, fatigue, corrosion studies and fracture toughness. Thermal and viscoelastic properties, acoustic and ultrasonic properties.

UNIT IV SURFACE CHARACTERIZATION
Surface properties and adhesion, contact angle measurement, scanning Electron Microscopy (SEM), transmission Electron Microscopy (TEM) and atomic force microscopy (AFM), secondary ion Mass Spectrometry, confocal laser scanning microscopy.
UNIT V  BIOMATERIAL TESTING
Biofunctionality and biocompatibility, preservation techniques for biomaterials, in vitro and invivo
Assessment of tissue compatibility, testing of blood (HLA typing and blood grouping) –materials, interactions and animal models.

OUTCOMES:
At the end of the course, the student should be able to:
• Analyze different types of materials and apply in designing a device.
• Choose materials for design of implants in tissue replacement.

TEXT BOOKS:

REFERENCES:

BM7005 BIOMETRIC SYSTEMS L T P C 3 0 0 3

OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To understand the general principles of design of biometric systems and the underlying trade-offs.
• To study the technologies of fingerprint, iris, face and speech recognition
• To study of evaluation of biometrics systems.

UNIT I INTRODUCTION TO BIOMETRICS 9
Introduction and back ground – biometric technologies – passive biometrics – active biometrics – Biometric characteristics, Biometric applications – Biometric Authentication systems- Taxonomy of Application Environment, Accuracy in Biometric Systems- False match rate- False non match rate- Failure to enroll rate- Derived metrics-Biometrics and Privacy.

UNIT II FINGERPRINT TECHNOLOGY 9
History of fingerprint pattern recognition - General description of fingerprints- fingerprint sensors, fingerprint enhancement, Feature Extraction- Ridge orientation, ridge frequency, fingerprint matching techniques- correlation based, Minutiae based, Ridge feature based, fingerprint classification, Applications of fingerprints, Finger scan- strengths and weaknesses, Evaluation of fingerprint verification algorithms.
UNIT III    FACE RECOGNITION AND HAND GEOMETRY

UNIT IV    IRIS RECOGNITION
Introduction, Anatomical and Physiological underpinnings, Iris sensor, Iris representation and localization- Daugman and Wilde’s approach, Iris matching, Iris scan strengths and Weaknesses, System performance, future directions

UNIT V    VOICE SCAN AND MULTIMODAL BIOMETRICS
Voice scan, speaker features, short term spectral feature extraction, Mel frequency cepstral coefficients, speaker matching, Gaussian mixture model, NIST speaker Recognition Evaluation Program, Introduction to multimodal biometric system – Integration strategies – Architecture – level of fusion – combination strategy, examples of multimodal biometric systems, Securing and trusting a biometric transaction – matching location – local host - authentication server – match on card (MOC).

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• Comprehend and appreciate the significance and role of this course in the present contemporary world
• Demonstrate the principles of biometric systems.
• Design and evaluate biometric systems.

TEXT BOOKS:

REFERENCES:
2. L C Jain, I Hayashi, S B Lee, U Halici, “Intelligent Biometric Techniques in Fingerprint and Face Recognition”

BM7006    BODY AREA NETWORKS

OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To know the hardware requirement of BAN
• To understand the communication and security aspects in the BAN
• To know the applications of BAN in the field of medicine

UNIT I    INTRODUCTION
Definition, BAN and Healthcare, Technical Challenges- Sensor design, biocompatibility, Energy Supply, optimal node placement, number of nodes, System security and reliability, BAN Architecture – Introduction
UNIT II HARDWARE FOR BAN
9
Processor-Low Power MCUs, Mobile Computing MCUs ,Integrated processor with radio
transceiver, Memory ,Antenna-PCB antenna, Wire antenna, Ceramic antenna, External antenna,
Sensor Interface, Power sources- Batteries and fuel cells for sensor nodes.

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
9
Monitoring patients with chronic disease, Hospital patients, Elderly patients, Cardiac arrhythmias
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
• Comprehend and appreciate the significance and role of this course in the present
  contemporary world
• Design a BAN for appropriate application in medicine
• Assess the efficiency of communication and the security parameters

TEXT BOOKS:
  III & V).
2. Sandeep K.S. Gupta,Tridib Mukherjee,Krishna Kumar Venkata Subramanian, “Body Area

REFERENCES:
3. Mehmet R. Yuce, Jamil Y.Khan, “Wireless Body Area Networks Technology, Implementation,
UNIT II  ELECTROPHYSIOLOGICAL SOURCES  9

UNIT III  FEATURE EXTRACTION METHODS  9

UNIT IV  FEATURE TRANSLATION METHODS  9

UNIT V  APPLICATIONS OF BCI  9

TOTAL: 45 PERIODS

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

• Comprehend and appreciate the significance and role of this course in the present contemporary world
• Evaluate BCI
• Assign functions appropriately to the human and to the machine
• Develop high-fidelity BCI prototypes

TEXT BOOKS:

REFERENCES:

OBJECTIVES:
• To Introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues.
• 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  9
8086, 80186, 80286, 80386, 80486 - Architecture, Memory management.

UNIT II  PENTIUM PROCESSORS  9
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, Virtual lab tools.

UNIT V TROUBLESHOOTING, MAINTAINING & REPAIRING

Memory troubleshooting, Monitor troubleshooting, Motherboard troubleshooting, Port troubleshooting, Sound Boards and Video adapters troubleshooting, USB troubleshooting.

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

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Explain 8086 family of processors, motherboards, PC based data acquisition and troubleshooting of PCs

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:

BM7009 MEDICAL OPTICS

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- The student should be made to study about the optical properties of the tissues and the applications of laser in diagnosis and therapy.

UNIT I OPTICAL PROPERTIES OF THE TISSUES

Refraction, Scattering, Absorption, Light transport inside the tissue, Tissue properties, Laser Characteristics as applied to medicine and biology-Laser tissue Interaction-Chemical-Thermal-Electromechanical – Photoablatative processes.

UNIT II INSTRUMENTATION IN PHOTONICS

Instrumentation for absorption, Scattering and emission measurements, excitation light sources – high pressure arc lamp, LEDs, Lasers, Optical filters, - optical detectors - Time resolved and phase resolved detectors.
UNIT III SURGICAL APPLICATIONS OF LASERS 9
Lasers in ophthalmology - Dermatology - Dentistry-Urology-Otolaryngology - Tissue welding.

UNIT IV NON THERMAL DIAGNOSTIC APPLICATIONS 9
Optical coherence tomography, Elastography, Laser Induced Fluorescence (LIF)-Imaging, FLIM Raman Spectroscopy and Imaging, FLIM – Holographic and speckle application of lasers in biology and medicine.

UNIT V THERAPEUTIC APPLICATIONS 9
Phototherapy, Photodynamic therapy (PDT) - Principle and mechanism - Oncological and non-oncological applications of PDT - Biostimulation effect – applications-Laser Safety Procedures.

TOTAL: 45 PERIODS

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

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Demonstrate knowledge of the fundamentals of optical properties of tissues
- Describe surgical applications of laser.
- Describe photonics and its therapeutic applications.

TEXT BOOKS:

REFERENCES:

BM7010 MEDICAL PHYSICS L T P C 3 0 0 3

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study effects of sound and light in human body
- To understand the effects of radiation in matter and how isotopes are produced

UNIT I NON IONIZING RADIATION AND ITS MEDICAL APPLICATION 9

UNIT II 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-Milking process (Technetium generator)
UNIT III  INTERACTION OF RADIATION WITH MATTER  9

UNIT IV  PRINCIPLES OF RADIATION DETECTION AND DOSIMETERS  9
Principles of radiation detection, Properties of dosimeters, Theory of gas filled detectors, Ionization Chamber, Proportional chamber, G.M. Counter, Film dosimetry, luminescence dosimetry, scintillation detectors, Radiation detection instruments, Area survey meters, Personal Radiation monitoring device, Film badge, TLD, OSLD.

UNIT V  BASIC RADIATION QUANTITIES  9
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:
- To comprehend and appreciate the significance and role of this course in the present contemporary world
- Discuss the effect of light and sound in human body.
- Discuss the effects and measurement of ionizing radiation.

TEXT BOOKS:

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

BM7011  MEMS AND ITS BIOMEDICAL APPLICATIONS  L T P C 3 0 0 3

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To learn various MEMS fabrication techniques.
- To understand different types of sensors and actuators and their principles of operation at the micro scale level.
- To know the applications of MEMS in different fields of medicine

UNIT I  MEMS MATERIALS AND FABRICATION  9
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, thermo mechanics, 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

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, electronic nose.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Discuss various MEMS fabrication techniques.
- Explain different types of sensors and actuators and their principles of operation at the micro scale level.
- Design MEMS device for different medical applications.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To be familiar with the nervous system development
- To be exposed to neuronal diseases and disorders
- To be familiar with nerve reconstruction and repairing

UNIT I  BASICS OF NEURON STRUCTURE AND FUNCTIONS  9

UNIT II  BRAIN, BRAIN STEM AND SPINAL CORD  9

UNIT III  NEUROPHYSIOLOGY & NEURORADIOLOGY  9

UNIT IV  NEURONAL DISEASES AND DISORDERS  9

UNIT V  NERVE RECONSTRUCTION AND REPAIRING  9
Regeneration of the peripheral nervous system. Nerve graft; Neural tissue engineering; Drug delivery system in CNS. Cognitive & neurobehavioral rehabilitation.

TOTAL : 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to
- Explain the structure of human nervous system
- Apply neural tissue engineering for rehabilitation
- Discuss about Regeneration of nervous system

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To understand the application of Physiological models and Vital organs.
- To understand methods and techniques for analysis and synthesis of dynamic models.
- To model dynamically varying physiological system.
- To develop differential equations to describe the dynamic models.
- To simulate and visualize, dynamic responses of physiological models using software.

UNIT I  SYSTEM CONCEPT  9

UNIT II  SYSTEM ANALYSIS  9
Review of transfer function, transfer function of coupled system. Impedance based transfer function - flexible tube feeding a single port compliant model, development of a lung model. Periodic signals: sinusoidal analysis of second order system, analysis of respiratory system based on sinusoidal excitation, pendelluft.

UNIT III  TRANSIENT AND FEEDBACK  9

UNIT IV  MODELING OF CARDIO PULMONARY SYSTEM  9
Model of cardiac output regulation - Starling’s law, Physical Significance of under damped responses of post systolic operations in aortic arch, model of circadian rhythms, chemical regulation of ventilation, Cheyne-Stoke breathing, biot breathing.

UNIT V  OTHER PHYSIOLOGICAL MODELS AND SIMULATION  9
Steady state analysis of regulation of glucose, Hodgkin-Huxley model, Thermal system – model and simulation, modeling of eye movement- types of eye movement, saccade model, model of oculomotor control. , 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.
- Analyze and synthesize dynamic models of physiological system.
- Develop differential equations to describe the dynamic models, simulate and visualize.
- Implement physiological models using software to get dynamic responses.

TEXT BOOKS:

REFERENCES:

BM7014 PRINCIPLES OF TISSUE ENGINEERING

OBJECTIVES:
- To study Cell cycle and differentiation
- To learn basics about stem cells and its applications
- To describe Different synthetic and biomaterials in tissue replacements

UNIT I FUNDAMENTALS OF TISSUE ENGINEERING
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
Definition of stem cells - types of stem cells – differentiation, dedifferentiation maturation, proliferation, pleuripotency and immortalization. Sources of stem cells: haematopoietic – fetal - cord blood – placenta - bone marrow - primordial germ cells - cancer stem cells - induced pleuripotent stem cells.

UNIT III COMPONENTS OF TISSUE ENGINEERING

UNIT IV MATERIALS IN TISSUE ENGINEERING

UNIT V APPLICATION OF TISSUE ENGINEERING

TOTAL : 45 PERIODS

OUTCOMES:
After the completion of these course students able to:
- Acquire ability to function on multi-disciplinary teams
- Apply the knowledge of professional and ethical responsibility in use of stem cells and gene therapy in creating tissue engineered therapies.
- Gain knowledge in research or clinical application on tissue repair/ engineering.
TEXT BOOKS:

REFERENCES:

BM7015 REHABILITATION ENGINEERING L T P C 3 0 0 3

OBJECTIVES:
- To explain the need for medical aids.
- To understand the sensory rehabilitation systems.
- To learn the use of the orthopedic prosthetics and orthotics in rehabilitation.
- To have an understanding of rehabilitation medicine and advocacy.

UNIT I INTRODUCTION

UNIT II ENGINEERING CONCEPTS IN SENSORY REHABILITATION ENGINEERING

UNIT III ORTHOPEDIC PROSTHETICS AND ORTHOTICS IN REHABILITATION
Engineering concepts in motor rehabilitation, Artificial limbs- body powered, externally powered and controlled orthotics and prosthetics, Myoelectric hand and arm prosthetics. Functional Electrical Stimulation systems-Restoration of hand function, restoration of standing and walking, Hybrid Assistive Systems (HAS).

UNIT IV VIRTUAL REALITY IN REHABILITATION
Introduction to virtual reality, Virtual reality based rehabilitation, Hand motor recovery systems with Phantom haptics, Robotics and Virtual Reality Applications in Mobility Rehabilitation.

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.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Devise new concepts for future development and applications.
- Design and develop different sensory assist devices, orthotics and prosthetics for rehabilitation applications.
TEXT BOOKS:

REFERENCES:
7. Rory A Cooper (Editor), Hisaichi Ohnabe (Editor), Douglas A. Hobson (Editor), 'An Introduction to Rehabilitation Engineering (Series in Medical Physics and Biomedical Engineering' CRC Press, 2006.

BM7016 VIRTUAL REALITY L T P C
3 0 0 3

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To impart the fundamental aspects, principles of virtual reality technology
- To gain knowledge about applications of virtual reality

UNIT I  INTRODUCTION

UNIT II  MODELING
Geometric modeling - kinematics modeling- physical modeling - behavior modeling - model management.

UNIT III  HUMAN FACTORS
Methodology and terminology-user performance studies-VR health and safety issues-Usability of virtual reality system- cyber sickness -side effects of exposures to virtual reality environment

UNIT IV  VR PROGRAMMING
Introducing Java 3D-loading and manipulating external models-using a lathe to make shapes. 3D Sprites- animated 3D sprites-particle systems.

UNIT V  APPLICATIONS
Medical applications--robotics applications- Advanced Real time Tracking-other applications-games, movies, simulations, therapy

TOTAL: 45 PERIODS
OUTCOMES:
At the end of the course the student should be able to
- Comprehend and appreciate the significance and role of this course in the present contemporary world
- understand the basic concepts of Virtual reality
- expose the concept of Virtual Reality Programming with toolkits.
- Design of various modeling concepts.
- Develop the Virtual Reality applications in different areas

TEXT BOOKS:

REFERENCES:

BM7017 WEARABLE SYSTEMS

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To know the sensor and signal processing requirement of wearable systems
- To understand the communication and security aspects
- To know the level of energy involvement in wearable systems

UNIT I SENSORS
Need for wearable systems, Sensors for wearable systems-Inertia movement sensors, Respiration activity sensor, Inductive plethysmography, Impedance plethysmography, pneumography, Wearable ground reaction force sensor, GSR, Radiant thermal sensor, Wearable motion sensors, CMOS – Based Biosensors, E-Textiles, Bio compatibility

UNIT II SIGNAL PROCESSING
Wearability issues - physical shape and placement of sensor, Technical challenges - sensor design, signal acquisition, Constraint on sampling frequency for reduced energy consumption, light weight signal processing, Rejection of irrelevant information, Data mining

UNIT III ENERGY HARVESTING FOR WEARABLE DEVICES
Solar cell, Vibration based, Thermal based, Human body as a heat source for power generation, Hybrid thermoelectric photovoltaic energy harvests, Thermopiles.

UNIT IV WIRELESS HEALTH SYSTEMS
Need for wireless monitoring, Definition of Body area network, BAN and Healthcare, Technical Challenges- System security and reliability, BAN Architecture – Introduction, Wireless communication techniques.

UNIT V APPLICATIONS OF WEARABLE SYSTEMS
Medical Diagnostics, Medical Monitoring-Patients with chronic disease, Hospital patients, Elderly patients, Multi parameter monitoring, Neural recording, Gait analysis, Sports Medicine, Smart Fabrics

TOTAL: 45 PERIODS
OUTCOMES:
At the end of the course the student should be able to
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• Choose appropriate sensors and signal processing techniques for wearable systems
• Assess the energy requirement for a wearable system
• Evaluate the security issues related to wearable systems

TEXT BOOKS:

REFERENCES:
1. Hang, Yuan-Ting, "Wearable medical sensors and systems", Springer-2013

EC7022 INTERNET AND JAVA L T P C 3 0 0 3

OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To introduce various concepts of internetworking with TCP/IP
• To introduce the principles of world wide web
• To introduce Java programming and Java script programming
• To teach students to develop simple web pages with data bases

UNIT I INTERNET WORKING WITH TCP/IP 9
Review of network technologies, Internet addressing, Address resolution protocols (ARP/ RARP), Routing IP data grams Reliable stream transport service (TCP) TCP/IP over ATM networks, Internet applications E-mail, Telnet, FTP, NFS, Internet traffic management.

UNIT II WORLD WIDE WEB 9
HTTP protocol, Web browsers Netscape, Internet explorer, Web site and web page design, HTML, XHTML, XML, CSS, Dynamic HTML, CGI.

UNIT III JAVASCRIPT PROGRAMMING 9
Introduction, Control statements, Functions, Arrays and Objects – Programming

UNIT IV JAVA PROGRAMMING 9
Language features, Classes, Object and methods. Sub-classing and dynamic binding, Multithreading, Overview of class library, Object method serialization, Remote method invocation, Java Servelets and Javaserver pages.
UNIT V WEB DESIGN AND DATABASES
Macromedia Dream Weaver, Web Servers, Databases – SQL, MYSQL, DBI and ADO.NET, Web design

TOTAL : 45 PERIODS

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

TEXT BOOKS:

REFERENCES:

EC7071 ADVANCED MICROCONTROLLERS

OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To introduce the concept of microcontroller based system development.
• To introduce the concept of RISC and CISC microcontrollers.
• To study the architecture of PIC, R8C and MSP430 family microcontrollers

UNIT I RISC PROCESSORS
RISC Vs CISC, RISC properties and evolution, Advanced RISC microcontrollers, PIC18xx microcontroller family, Architecture, Instruction set, ROM, RAM, Timer programming, Serial port programming, Interrupt programming, ADC and DAC interfacing, CCP module and programming.

UNIT II CISC PROCESSORS
RL78 16 BIT Microcontroller architecture, addressing modes, on-Chip memory, ADC, interrupts, MAC unit, Barrel shifter, internal and external clock generation, memory CRC, on chip debug function and self programming.
UNIT III  MSP430 16 - BIT MICROCONTROLLER 9
The MSP430 Architecture, CPU Registers, Instruction Set, addressing modes, the MSP430 family viz. MSP430x2x, MSP430x4x, MSP430x5x. Low power aspects of MSP430 : low power modes, active Vs standby current consumption, FRAM Vs Flash for low power and reliability.

UNIT IV  PROGRAMMING AND PERIPHERAL INTERFACE USING MSP430 FAMILIES 9
Memory mapped peripherals, I/O pin multiplexing, Timers, RTC, watchdog timer, PWM control, Analog interfacing and data acquisition, DMA, programming with above internal peripherals using optimal power consumption. Case study: Remote control of air conditioner and home appliances.

UNIT V  COMMUNICATION INTERFACE USING MSP 430 MICROCONTROLLER 9
Serial and parallel communication, synchronous and asynchronous interfaces, Implementing and programming of : UART, I2C and SPI protocol. wireless connectivity : NFC, Zigbee, bluetooth and WiFi. MSP430 development tools. Case study: Implementing WiFi connectivity in smart electric meter.

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- The students will be able to
- Define, formulate and analyze microcontroller based system.
- Ability to work with PIC, R8C and MSP 430 microcontroller for a specific real world application.
- Ability to describe the architecture and programming of PIC, R8C and MSP 430 microcontroller
- Manage a project from start to finish

TEXT BOOK:

REFERENCES:
UNIT II  MODERN SYMMETRIC KEY CIPHERS

Modern block ciphers – Modern stream ciphers – DES – AES – uses of modern block ciphers and stream cipher, Application Examples

UNIT III  ASYMMETRIC KEY ENCIPHERMENT


UNIT IV  INTEGRITY AUTHENTICATION AND KEY MANAGEMENT


UNIT V  NETWORK SECURITY


TOTAL : 45 PERIODS

OUTCOMES:

• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• The student have gained the knowledge about the importance of security for networks, use of number theory and Galois field concepts.
• The student would have ability to design new symmetric and Asymmetric key crypto system
• The student would have ability to develop new authentication and key management techniques.

TEXT BOOKS:


REFERENCES:


EC7073  ELECTRO MAGNETIC INTERFERENCE AND L T P C 3 0 0 3

COMPATIBILITY

OBJECTIVES:

• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To tutor the basics of EMI,EMC
• To instill knowledge on the EMI coupling mechanism and its mitigation techniques
• To impart comprehensive insight about the current EMC standards and about various measurement techniques.
UNIT I BASIC CONCEPTS
Definition of EMI and EMC; Intra and Inter system EMI; Sources and victims of EMI, Conducted and Radiated EMI emission and susceptibility; Transient & ESD; Case Histories; Radiation Hazards to humans.

UNIT II COUPLING MECHANISM
Common made coupling; Differential mode coupling; Common impedance coupling; Ground loop coupling; Field to cable coupling; Cable to cable coupling; Power mains and Power supply coupling.

UNIT III EMI MITIGATION TECHNIQUES
Shielding – principle, choice of materials for H, E and free space fields, and thickness; EMI gaskets; Bonding; Grounding – circuits, system and cable grounding; Filtering; Transient EMI control devices and applications; PCB Zoning, Component selection, mounting, trace routing.

UNIT IV STANDARDS AND REGULATION
Units of EMI; National and International EMI Standardizing Organizations – IEC, ANSI, FCC, CISPR, BIS, CENELEC; FCC standards; EN Emission and Susceptibility standards and specifications; MIL461E Standards.

UNIT V TEST METHODS AND INSTRUMENTATION
EMI test sites - Open area site; TEM cell; Shielded chamber; Shielded Anechoic chamber; EMI test receivers; Spectrum Analyzer; Transient EMI Test wave Simulators; EMI coupling Networks - Line impedance Stabilization Networks; Feed through capacitors; Antennas and factors; Current probes and calibration factor; MIL-STD test methods; Civilian STD Test methods, Government policies.

TOTAL : 45 PERIODS

OUTCOMES:
- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Upon Completion of the course, the students will be able to
  - To design a EMI free system
  - To reduce system level crosstalk
  - To design high speed Printed Circuit board with minimum interference
  - To make our world free from unwanted electromagnetic environment

TEXT BOOKS:

REFERENCES:
2. C.R. Paul, —Introduction to Electromagnetic CompatibilityII, John wiley & sons Inc. 2006
OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• The objectives of the course is to introduce quantum mechanics concepts, approximations and statistical mechanics for understanding nano systems

UNIT I INTRODUCTION TO QUANTUM MECHANICS  
Particles, waves, probability amplitudes, schrodinger equation, wave packets solutions, operators, expectation values, eigenfuntions, piecewise constant potentials.

UNIT II SIMPLE HARMONIC OSCILLATORS AND APPROXIMATIONS  
SHM Operators, SHM wavepacket solutions, Quantum LC circuit, WKB approximations, variational methods.

UNIT III SYSTEMS WITH TWO AND MANY DEGREES OF FREEDOM  
Two level systems with static and dynamic coupling, problems in more than one dimensions, electromagnetic field quantization, density of states.

UNIT IV STATISTICAL MECHANICS  
Basic concepts, microscopic, quantum systems in equilibrium, statistical models applied to metals and semiconductors

UNIT V APPLICATIONS  
Hydrogen and Helium atoms, electronic states, Atomic force microscope, Nuclear Magnetic Resonance, carbon nanotube properties and applications

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• Ability to apply the knowledge on quantum mechanics concepts, approximations and statistical mechanics related to nano systems

TEXT BOOKS:
2. Rainer Waser, “Nanoelectronics and Information Technology”, Wiley 2005

REFERENCES:
OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce probability related study of the characteristics of text, voice, image and video data
- To introduce various compression schemes for text, voice, image and video
- To analyse the compression schemes
- To introduce communication protocols for voice over internet and multimedia networking

UNIT I   MULTIMEDIA COMPONENTS  9
Introduction - Multimedia skills - Multimedia components and their characteristics - Text, sound, images, graphics, animation, video, hardware.

UNIT II  AUDIO AND VIDEO COMPRESSION  9

UNIT III TEXT AND IMAGE COMPRESSION  9
Compression principles - source encoders and destination encoders - lossless and lossy compression - entropy encoding - source encoding - text compression - static Huffman coding - dynamic Huffman coding - arithmetic coding - Lempel Ziv-Welsh Compression - image compression

UNIT IV  VoIP TECHNOLOGY  9
Basics of IP transport, VoIP challenges, H.323/ SIP – Network Architecture, Protocols, Call establishment and release, VoIP and SS7, Quality of Service – CODEC Methods - VOIP applicability

UNIT V  MULTIMEDIA NETWORKING  9
Multimedia networking - Applications - streamed stored and audio-making – Best Effort services - protocols for real time interactive Applications - distributing multimedia beyond best effort service - secluding and policing Mechanisms - integrated services - differentiated Services - RSVP.

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Various components of multimedia have been studied
- Compressions and decompressions of multimedia components are explored
- The adaptation of compression techniques in various state-of-the-art technologies were observed

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study the architecture and programming of ARM processors.
- To introduce the basic concepts of hard real time multiprocessing.
- To introduce the analytical concepts for effective programming.
- To study about the basics of the buses used for embedded system networking.

UNIT I INTRODUCTION TO EMBEDDED COMPUTING AND ARM PROCESSORS

Complex systems and microprocessors – Embedded system design process – Formalism for system design– Design example: Model train controller- ARM Processor Fundamentals- Instruction Set and Programming using ARM Processor.

UNIT II COMPUTING PLATFORM

CPU: Programming input and output – Supervisor mode, exception and traps – Coprocessor – Memory system mechanism – CPU performance – CPU power consumption- CPU buses – Memory devices – I/O devices – Component interfacing- System Level Performance Analysis- Parallelism. Design Example: Data Compressor.

UNIT III PROGRAM DESIGN AND ANALYSIS

Program design – Model of programs – Assembly and Linking – Basic compilation techniques – Program Optimization- Analysis and optimization of execution time, power, energy, program size – Program validation and testing- Example: Software Modem.

UNIT IV PROCESS AND OPERATING SYSTEMS


UNIT V HARDWARE ACCELERATORS & NETWORKS


TOTAL : 45 PERIODS

OUTCOMES:

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

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Ability to design and develop ARM processor based systems.
- Ability to develop embedded system for entertainment, communication and medical applications.
- Ability to implement distributed embedded computing platform and proper scheduling of the process.

TEXT BOOKS:

REFERENCES:

EC7077 ROBOTICS L T P C
3 0 0 3

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce the electronics and software aspects in the design of robots
- To bring out the different languages for programming robot
- To specify robot requirements in the industry
- To introduce latest state of the art robots

UNIT I SCOPE OF ROBOTS
The scope of industrial Robots - Definition of an industrial robot - Need for industrial robots – Economic and Social Issues- applications.

UNIT II ROBOT COMPONENTS

UNIT III ROBOT PROGRAMMING
Robot Programming - Methods - interlocks textual languages. Characteristics of Robot level languages, characteristic of task level languages.

UNIT IV ROBOT WORK CELL
Robot Cell Design and Control - Remote Center compliance - Safety in Robotics.

UNIT V FUTURE TRENDS

TOTAL : 45 PERIODS

OUTCOMES:
- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Ability to design and develop robotic based systems.
- Ability to develop system for industrial automation and medical applications.
- Ability to provide automatic solution for replacing humans in life threatening area.

TEXT BOOKS:
REFERENCES:

EC7078 SOFT COMPUTING AND APPLICATIONS

OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• This course gives an idea and principles of various soft computing techniques, which are applicable to core areas such as networks, pattern recognition, image processing
• To introduce fuzzy set theory
• To teach different optimization techniques
• To introduce neural networks and neuro-fuzzy modeling
• To teach various applications of computational intelligence

UNIT I Fuzzy Set Theory

UNIT II Optimization

UNIT III Neural Networks

UNIT IV Neuro Fuzzy Modeling

UNIT V Applications of Computational Intelligence

TOTAL : 45 PERIODS
OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- 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.
  - Discuss hybrid soft computing

TEXT BOOKS:

REFERENCES:

EC7079 SPEECH PROCESSING L T P C 3 0 0 3

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- 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
- To introduce speech recognition and synthesis techniques

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:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• To design fundamental algorithms for speech synthesis, coding and recognition
• To design systems for realizing multimedia applications with basic speech signal processing techniques

TEXT BOOKS:

REFERENCES:

EC7551 COMPUTER ARCHITECTURE AND ORGANIZATION  L T P C 3 0 0 3

OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To study the general purpose architecture for computer system.
• To study the design of data path unit and control unit for ALU operation.
• Understanding the concept of various memories.
• To introduce the concept of interfacing and organization of multiple processors.

UNIT I INTRODUCTION  9
UNIT II DATA PATH DESIGN
9
Fixed Point Arithmetic, Addition, Subtraction, Multiplication and Division, Combinational and Sequential ALUs, Carry look ahead adder, Robertson algorithm, booth’s algorithm, non-restoring division algorithm, Floating Point Arithmetic, Coprocessor, Pipeline Processing, Pipeline Design, Modified booth’s Algorithm

UNIT III CONTROL DESIGN
9
Hardwired Control, Micro programmed Control, Multiplier Control Unit, CPU Control Unit, Pipeline Control, Instruction Pipelines, Pipeline Performance, Superscalar Processing, Nano Programming.

UNIT IV MEMORY ORGANIZATION
9
Random Access Memories, Serial - Access Memories, RAM Interfaces, Magnetic Surface Recording, Optical Memories, multilevel memories, Cache & Virtual Memory, Memory Allocation, Associative Memory.

UNIT V SYSTEM ORGANIZATION
9
Communication methods, Buses, Bus Control, Bus Interfacing, Bus arbitration, IO and system control, IO interface circuits, Handshaking, DMA and interrupts, vectored interrupts, PCI interrupts, pipeline interrupts, IOP organization, operation systems, multiprocessors, fault tolerance, RISC and CISC processors, Superscalar and vector processor.

TOTAL: 45 PERIODS
OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• Describe data representation, instruction formats and the operation of a digital computer. (Level – II (Comprehension))
• Illustrate the data path unit and control unit for ALU operation. (Level – II (Comprehension))
• Discuss about implementation schemes of control unit and pipeline performance. (Level – II (Comprehension))
• Explain the concept of various memories, interfacing and organization of multiple processors. (Level – II (Comprehension))
• Discuss about the interrupts, I/Os and other components of the system. (Level – II (Comprehension))

TEXTBOOKS:

REFERENCES:
OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To learn the fundamentals of VLSI design
• To understand the IC Manufacturing Process
• To familiarize with VLSI combinational logic circuits design
• To familiarize with VLSI sequential logic circuits design
• To learn the various arithmetic circuits and testing methodologies
• To familiarize with the different FPGA architectures.

UNIT I MOS TRANSISTOR PRINCIPLES
MOS Technology and VLSI, Pass transistors, NMOS, CMOS Fabrication process and Electrical properties of CMOS circuits and Device modeling. Characteristics of CMOS inverter, Scaling principles and fundamental limits. Propagation Delays, CMOS inverter scaling, Stick diagram, Layout diagrams, Elmore’s constant, Logical Effort. Case study: Study of technology development in MOS.

UNIT II COMBINATIONAL LOGIC CIRCUITS
Static CMOS logic Design, Design techniques to improve the speed, power dissipation of CMOS logic, low power circuit techniques, Ratioed logic. Pass transistor Logic, Transmission CPL, DCVSL, Dynamic CMOS logic, Domino logic, Dual Rail logic, NP CMOS logic and NOR array logic.

UNIT III SEQUENTIAL LOGIC CIRCUITS
Static and Dynamic Latches and Registers, Timing Issues, Pipelines, Clocking strategies, Memory Architectures, and Memory control circuits.

UNIT IV DESIGNING ARITHMETIC BUILDING BLOCKS & TESTING
Data path circuits, Architectures for Adders, Accumulators, Multipliers, Barrel Shifters, Need for testing- Manufacturing test principles- Design for testability. Case study: Analysis of area, power and delay for 16 bit adder and 8 bit multiplier

UNIT V IMPLEMENTATION STRATEGIES
Full Custom and Semicustom Design, Standard Cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures. Demo: Complete ASIC flow using Backend tool and fabrication flow Overall case study: Development of IC in commercial aspects (design, testing and fab cost)

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• At the end of the course students will be in a position to apply the basics of VLSI design, testing and different FPGA architectures.

TEXT BOOK:
REFERENCES:

GE7071         DISASTER MANAGEMENT       L T P C       3 0 0 3

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

UNIT I      INTRODUCTION TO DISASTERS       9
Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II      APPROACHES TO DISASTER RISK REDUCTION (DRR)       9
Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayat Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders-institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III     INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT       9
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       9
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.

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

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

TOTAL: 45 PERIODS

OUTCOMES:
The students will be able to

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

TEXT BOOKS:

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

GE7072  FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT

OBJECTIVES:

- To understand the global trends and development methodologies of various types of products and services
- To 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
- To understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them into design specification
- To understand system modeling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics
- To develop documentation, test specifications and coordinate with various teams to validate and sustain up to the EoL (End of Life) support activities for engineering customers
UNIT I  FUNDAMENTALS OF PRODUCT DEVELOPMENT  9

UNIT II  REQUIREMENTS AND SYSTEM DESIGN  9

UNIT III  DESIGN AND TESTING  9

UNIT IV  SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT  9

UNIT V  BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY  9

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to:
- Define, formulate and analyze a problem
- Solve specific problems independently or as part of a team
- Gain knowledge of the Innovation & Product Development process in the Business Context
- Work independently as well as in teams
- Manage a project from start to finish

TEXTBOOKS:
1. Book specially prepared by NASSCOM as per the MoU.
REFERENCES:

GE7074 HUMAN RIGHTS L T P C 3 0 0 3

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:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• Engineering students will acquire the basic knowledge of human rights.

REFERENCES:
GE7351 ENGINEERING ETHICS AND HUMAN VALUES (Common to all branches)  

OBJECTIVES

• To emphasize into awareness on Engineering Ethics and Human Values.
• To understand social responsibility of an engineer.
• To appreciate ethical dilemma while discharging duties in professional life.

UNIT I HUMAN VALUES


UNIT II ENGINEERING ETHICS


UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as experimentation - engineers as responsible experimenters - codes of ethics – Importance of Industrial Standards - a balanced outlook on law – anticorruption- occupational crime -the challenger case study.

UNIT IV ENGINEER'S RIGHTS AND RESPONSIBILITIES ON SAFETY


UNIT V GLOBAL ISSUES

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-Sample code of conduct.

TOTAL : 45 PERIODS

OUTCOMES:

• Students will have the ability to perform with professionalism , understand their rights, legal, ethical issues and their responsibilities as it pertains to engineering profession with engaging in life-long learning with knowledge of contemporary issues.

TEXT BOOKS:

REFERENCES:
AIM:
To provide comprehensive knowledge about the principles, practices, tools and techniques of Total quality management.

OBJECTIVES:
- To understand the need for quality, its evolution, basic concepts, contribution of quality gurus, TQM framework, Barriers and Benefits of TQM.
- To understand the TQM Principles.
- To learn and apply the various tools and techniques of TQM.
- To understand and apply QMS and EMS in any organization.

UNIT I INTRODUCTION
Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality –Definition of TQM-- Basic concepts of TQM –Gurus of TQM (Brief introduction) -- TQM Framework- Barriers to TQM –Benefits of TQM.

UNIT II TQM PRINCIPLES

UNIT III TQM TOOLS & TECHNIQUES I

UNIT IV TQM TOOLS & TECHNIQUES II

UNIT V QUALITY MANAGEMENT SYSTEM

OUTCOMES:
- Ability to apply TQM concepts in a selected enterprise.
- Ability to apply TQM principles in a selected enterprise.
- Ability to apply the various tools and techniques of TQM.
- Ability to apply QMS and EMS in any organization.

TEXT BOOK:
REFERENCES: