### SEMESTER III

(Applicable to the Students Admitted from the Academic Year 2010 – 2011 onwards)

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AIM
To get the clear understanding of X-ray generation and radio isotopes and various techniques used for visualizing organs in detail.

OBJECTIVES
To study the functioning of X-ray tubes and scattered radiation and method by which fogginess can be reduced.
To study the different types radio diagnostic unit.
To know the techniques to visualize opaque, transparent organs.
To study the special techniques adopted to visualize different sections of any organ.

UNIT I MEDICAL X-RAY EQUIPMENT

UNIT II COMPUTER TOMOGRAPHY

UNIT III MAGNETIC RESONANCE IMAGING
Fundamentals of Magnetic Resonance- Interaction of nuclei with static Magnetic Field and

UNIT IV   NUCLEAR MEDICINE SYSTEMS


UNIT V   RADIATION THERAPY AND RADIATION SAFETY


TOTAL = 45 PERIODS

TEXT BOOKS

REFERENCE BOOKS
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-corporal 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

TEXT BOOKS:
REFERENCES

10144BM603  DIAGNOSTIC AND THERAPEUTIC EQUIPMENTS-II  L T P C
3 0 0 3

UNIT I  ULTRASONIC TECHNIQUE  9
Diagnosis: Basic principles of Echo technique, display techniques A, B and M mode,
Application of ultrasound as diagnostic tool – Echocardiogram, abdomen, obstetrics and
gynaecology, ophthalmology.

UNIT II  PATIENT MONITORING AND BIOTELEMETRY  9
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 III  DIATHERMY  9
IR and UV lamp and its application. Thermography – Recording and clinical application.
Short wave diathermy, ultrasonic diathermy, Microwave diathermy, Electro surgery
machine - Current waveforms, Tissue Responses, Electro surgical current level.

UNIT IV  EXTRA CORPOREAL DEVICES AND
SPECIAL DIAGNOSTIC TECHNIQUES  9
Need for heart lung machine, functioning of bubble, disc type and membrane type
oxygenerators, finger pump, roller pump, electronic monitoring of functional parameter.
Haemo Dialyser unit , Lithotripsy, Principles of Cryogenic technique and application,
Endoscopy, Laproscopy.

UNIT V  PATIENT SAFETY  9
Physiological effects of electricity – important susceptibility parameters – Macro shock –
Micro shock hazards – Patient’s electrical environment – Isolated Power system –
Conductive surfaces – Electrical safety codes and standards – Basic Approaches to
protection against shock, Protection equipment design, Electrical safety analyzer –
Testing the Electric system

TOTAL: 45 PERIODS

TEXT BOOK
2. John G. Webster, “Medical Instrumentation Application and Design”, John Willey and sons, 2002

REFERENCE BOOKS
5. Standard Handbook of Biomedical Engineering & Design – Myer Kutz
UNIT I WORLD WIDE WEB 9
HTTP protocol, Web browsers Netscape, Internet explorer, Web site and web page
design, XHTML, Dynamic HTML, CSS.

UNIT II JAVASCRIPT PROGRAMMING 9
Introduction, Control statements, Functions, Arrays and Objects.

UNIT III 9
Micromedia Dream Weaver, XML, Web Servers, Databases – SQL, MYSQL, DBI and
ADO.NET

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 MEDICAL STANDARDS 9
Web Design case studies – Design and development of Dynamic Hospital Information
System Web sites using Macromedia Dreamweaver, Java, XML, Javascript,
Programming Techniques. HL7 Standards, DICOM standards.

TOTAL=45 PERIODS

TEXT BOOKS:


REFERENCES:
MATLAB / Equivalent Software Package (30% of the course)
1. Generation of sequences (functional & random), correlation and convolution
2. Spectrum Analysis using FFT
3. Filter Design & Analysis
4. Filter Implementation in time-domain & frequency domain
5. Study of Quantization errors in DSP algorithms
6. Multirate Filters
7. Adaptive filter
8. Equalization
9. Echo Cancellation

DSP Processor Implementation (70% of the course)
1. Waveform Generation
2. FIR Implementation
3. IIR Implementation
4. FFT
5. Finite word Length effect
6. Multirate filters

TOTAL = 45 PERIODS
1. Programs using basic elements and design of Web pages, hyperlinks and web navigation using HTML, XHTML and CSS.
2. Java script programs using control statements, functions, arrays and objects and applications in web environment
3. Macromedia Dreamweaver platform to design and develop web pages, insert images and links into web pages, create XHTML elements to be able insert script into Dreamweaver pages and site management
4. Programs relating to relational database model, database queries using SQL, MYSQL database server and interfaces
5. Design a Java interface for ADT Stack. Develop two different classes that implement this interface, one using array and the other using linked-list. Provide necessary exception handling in both the implementations.
6. Design a Vehicle class hierarchy in Java. Write a test program to demonstrate polymorphism.
7. Design classes for Currency, Rupee, and Dollar. Write a program that randomly generates Rupee and Dollar objects and write them into a file using object serialization. Write another program to read that file, convert to Rupee if it reads a Dollar, while leave the value as it is if it reads a Rupee.
8. Design a scientific calculator using event-driven programming paradigm of Java.
9. Write a multi-threaded Java program to print all numbers below 100,000 that are both prime and fibonacci number (some examples are 2, 3, 5, 13, etc.). Design a thread that generates prime numbers below 100,000 and writes them into a pipe. Design another thread that generates fibonacci numbers and writes them to another pipe. The main thread should read both the pipes to identify numbers common to both.
10. Design and development of a web based dynamic Hospital Information System
10144BM609  DIAGNOSTIC AND THERAPEUTIC EQUIPMENT LAB  L T P C

 0 0 3 2

1. Recording and analysis of ECG signals
2. Recording and analysis of EEG signals.
3. Recording - Fatigue test of EMG signals.
4. Simulation of ECG – detection of QRS complex and heart rate
5. Study of Pacemaker simulator
6. Study of Defibrillator simulator
7. Study of shortwave and ultrasonic diathermy.
8. Study of biotelemetry
10. Mini project.

TOTAL=45 PERIODS
SEMESTER VII

10144BM701  PATTERN RECOGNITION AND NEURAL NETWORKS  L T P C
3 0 0 3

UNIT I  INTRODUCTION AND SIMPLE NEURAL NET  9
Elementary neurophysiology and biological neural network - Artificial neural network –
Architecture, biases and thresholds, Hebb net, Perceptron, Adaline and Madaline.

UNIT II  BACK PROPOGATION AND ASSOCIATIVE MEMORY  9
Back propogation network, generalized delta rule, Bidirectional Associative memory,
Hopefield network

UNIT III  NEURAL NETWORKS BASED ON COMPETITION  9
Kohonen Self organising map, Learning Vector Quantisation, counter propogation network.

UNIT IV  UNSUPERVISED LEARNING AND CLUSTERING ANALYSIS  9
Patterns and features, training and learning in pattern recognition, discriminant functions,
different types of pattern recognition. Unsupervised learning- hierarchical clustering,
partitional clustering. Neural pattern recognition approach – perceptron model

UNIT V  SUPERVISED LEARNING USING PARAMETRIC AND
NON PARAMETRIC APPROACH  9
Bayesian classifier, non parametric density estimation, histograms, kernels, window
estimators, k-nearest neighbour classifier, estimation of error rates.

TOTAL: 45 PERIODS
TEXT BOOKS:
2. House Pvt. Ltd., New Delhi, 2002

REFERENCES:
UNIT I MEDICAL INFORMATICS
Introduction - Structure of Medical Informatics – Internet and Medicine - Security issues, Computer based medical information retrieval, Hospital management and information system, Functional capabilities of a computerized HIS, e-health services, Health Informatics – Medical Informatics, Bioinformatics

UNIT II COMPUTERISED PATIENT RECORD
Introduction - History taking by computer, Dialogue with the computer, Components and functionality of CPR, Development tools, Intranet, CPR in Radiology- Application server provider, Clinical information system, Computerized prescriptions for patients.

UNIT III COMPUTERS IN CLINICAL LABORATORY AND MEDICAL IMAGING
Automated clinical laboratories-Automated methods in hematology, cytology and histology, Intelligent Laboratory Information System - Computerized ECG, EEG and EMG, Computer assisted medical imaging- nuclear medicine, ultrasound imaging ultrasonography-computed X-ray tomography, Radiation therapy and planning, Nuclear Magnetic Resonance

UNIT IV COMPUTER ASSISTED MEDICAL DECISION-MAKING
Neuro computers and Artificial Neural Networks application, Expert system - General model of CMD, Computer –assisted decision support system-production rule system cognitive model, semester networks , decisions analysis in clinical medicine-computers in the care of critically patients-computer assisted surgery-designing

UNIT V RECENT TRENDS IN MEDICAL INFORMATICS
Virtual reality applications in medicine, Computer assisted surgery , Surgical simulation , Telemedicine - Tele surgery computer aids for the handicapped, computer assisted instrumentation in Medical Informatics - Computer assisted patient education and health - Medical education and health care information.

TOTAL: 45 PERIODS
TEXT BOOKS:
UNIT I  OPTICAL PROPERTIES OF THE TISSUES  9
Refraction, Scattering, absorption, light transport inside the tissue, tissue properties,
Light interaction with tissues, optothermal interaction, fluorescence, speckles.

UNIT II  INSTRUMENTATION IN PHOTONICS  9
Instrumentation for absorption, scattering and emission measurements, excitation light
sources – high pressure arc lamp, solid state LEDs, Lasers, optical filters, polarizer, solid
state detectors, time resolved and phase resolved detectors.

UNIT III  APPLICATIONS OF LASERS  9
Laser in tissue welding, lasers in dermatology, lasers in ophthalmology, otolaryngology,
urology.

UNIT IV  OPTICAL TOMOGRAPHY  9
Optical coherence tomography, Elastrography, Doppler optical coherence tomography,
Application towards clinical imaging.

UNIT V  SPECIAL OPTICAL TECHNIQUES  9
Near field imaging of biological structures, in vitro clinical diagnostic, fluorescent
spectroscopy, photodynamic therapy.

TOTAL: 45 PERIODS

TEXT BOOKS:
2. Mark E. Brezinski., Optical Coherence Tomography: Principles and

REFERENCES:
1. Leon Goldman, M.D., & R. James Rockwell, Jr., “Lasers in Medicine”, Gordon and
2. R. Splinter and B.A Hooper, An Introduction to BioMedical Optics, Taylor and
Francis, 2007.
AIM
To study the image processing techniques

OBJECTIVES
To study the image fundamentals and image transforms
To study the image enhancement techniques
To study the image restoration procedures
To study the image compression procedures

UNIT I DIGITAL IMAGE FUNDAMENTAL
Elements of digital image processing systems - Elements of visual perception – image
sampling and quantization – basic relationships between pixels - matrix and singular
value representation of discrete images.

UNIT II IMAGE TRANSFORMS
their properties.

UNIT III IMAGE ENHANCEMENT
Gray level transformation – Histogram processing – enhancement using arithmetic/logic
operation – spatial filtering – smoothening and sharpening spatial filter – smoothening in
frequency domain filter – homomorphic filtering

UNIT IV IMAGE RESTORATION AND RECOGNITION
Image degradation models – unconstrained and constrained restoration – inverse
filtering – LMS filter – geometric mean filter – geometric transformation – pattern classes
UNIT V          IMAGE COMPRESSION

Image compression models – elements of information theory – error free compression –
lossy compression – run-length – Huffman coding – shift codes – arithmetic coding – bit
plane coding – transform coding – JPEG standards – MPEG standards - wavelet
transform – predictive techniques – block truncation coding schemes – facet modeling.
Image segmentation – detection of discontinuities – edge linking and boundary detection
– thresholding – region based segmentation – segmentation by morphological
watersheds – use of motion in segmentation.

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:
   Hill, 1995
1. Display of Grayscale Images.
2. Histogram Equalization.
4. Edge detection using Operators.
5. 2-D DFT and DCT.
6. Filtering in frequency domain.
7. Display of color images.
8. Conversion between color spaces.
9. DWT of images.
10. Segmentation using watershed transform.

TOTAL: 45 PERIODS

REFERENCE:

LIST OF EQUIPMENTS:
Computer, Software MATLAB
UNIT I   INTRODUCTORY CONCEPTS
Fluids and non-fluids – Continuum coordinate systems – Force and moments – Stress at a point – Rate of strain – Properties of fluids – Classification of fluids.

UNIT II   FLUID FLOW
Different types of fluid flows – Laminar and turbulent flow – Transition from laminar to turbulent flow – Laminar flow – Annulus – Laminar flow between parallel plates – Measurement of viscosity.

UNIT III  BOUNDARY LAYER FLOW

UNIT IV   FLOW PROPERTIES OF BLOOD:

UNIT V   CARDIAC AND RESPIRATORY MECHANICS

TOTAL: 45 PERIODS
TEXT BOOKS:

REFERENCES:
2. Biomechanics by Nihanth ozkai,
UNIT I  BIOMETRIC FUNDAMENTALS
Key Biometric terms and Processes – Definitions-verification and identification – matching, Accuracy in Biometric Systems – False match rate - False nonmatch rate - Failure to enroll rate – Derived metrics - An Introduction to Biometric Authentication Systems- a taxonomy of application environment, a system model, biometrics and privacy.

UNIT II  FINGERPRINT IDENTIFICATION TECHNOLOGY

UNIT III  IRIS RECOGNITION
Introduction, Anatomical and Physiological underpinnings, Components, Sensing, Iris Scan Representation and Matching, Iris Scan Strengths and Weaknesses, System Performance, Future Directions.

UNIT IV  FACE RECOGNITION
Introduction, components, Facial Scan Technologies, Face Detection, Face Recognition-Representation and Classification, Kernel- based Methods and 3D Models, Learning the Face Spare, Facial Scan Strengths and Weaknesses, Methods for assessing progress in Face Recognition.

UNIT V  VOICE SCAN

TOTAL: 45 PERIODS
TEXT BOOK:

REFERENCE:
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, Microprogrammed 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
TEXT BOOK:

REFERENCES:
UNIT I  PRINCIPLES OF OBJECT ORIENTED PROGRAMMING  9
Introduction- Tokens-Expressions-contour Structures –Functions in C++, classes and objects, constructors and destructors ,operators overloading and type conversions .

UNIT II  ADVANCED OBJECT ORIENTED PROGRAMMING  9
Inheritance, Extending classes, Pointers, Virtual functions and polymorphism, File Handling Templates ,Exception handling, Manipulating strings.

UNIT III  DATA STRUCTURES & ALGORITHMS  9
Algorithm, Analysis, Lists, Stacks and queues, Priority queues-Binary Heap-Application, Heaps, skew heaps, Binomial –hashing-hash tables without linked lists

UNIT IV  NONLINEAR DATA STRUCTURES  9

UNIT V  SORTING AND SEARCHING  9

TOTAL: 45 PERIODS

TEXT BOOKS:
REFERENCES:
UNIT I

UNIT II
IP – Patents – Copyrights and related rights – Trade Marks and rights arising from Trademark registration – Definitions – Industrial Designs and Integrated circuits – Protection of Geographical Indications at national and International levels – Application Procedures..

UNIT III

UNIT IV

UNIT V
Case Studies on – Patents (Basumati rice, turmeric, Neem, etc.) – Copyright and related rights – Trade Marks – Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition.

TOTAL: 45 PERIODS
TEXT BOOKS:


REFERENCES:

UNIT I


UNIT II

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.

UNIT III


UNIT IV

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

UNIT V

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

TOTAL: 45 PERIODS
TEXT BOOKS:

REFERENCES:
UNIT I  PROPERTIES OF SYSTEMS AND ELECTRICAL ANALOG  

UNIT II  TRANSFER FUNCTIONS 
Transfer functions and its use, Study of transfer function of first order and second order systems, engineering concept in coupled system, example of Transformed signals.

UNIT III  IMPEDANCE CONCEPT 
Transfer functions with impedance concept, prediction of performance, identification of the system from impedance function, periodic signals, relationship between transfer function and sinusoidal response, evaluation of transfer function from frequency response.

UNIT IV  FEEDBACK SYSTEMS 
Characteristics of physiological feedback systems, stability analysis of systems.

UNIT V  SIMULATION OF BIOLOGICAL SYSTEMS 
Simulation of thermal regulation, pressure and flow control in circulation, oculo motor system, endocrinial system, functioning of receptors.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCE:
UNIT I BIOINFORMATICS
Introduction, Overview of structural Bioinformatics; Characteristics, Categories, Navigation and information retrieval of Bioinformatics databases.

UNIT II DATABASES
Description and Organisation of Sequence, Structure and Other databases; Database Warehousing and data mining in Bioinformatics.

UNIT III TOOLS
Need for tools, Knowledge discovery, Industry trends and data mining tools; Data submission tools, Data analysis tools, Prediction tools and modeling tools.

UNIT IV MACHINE LEARNING IN BIOINFORMATICS
Neural network, Genetic and fuzzy logic applications in Bioinformatics; Modeling for Bioinformatics – Hidden Markov, Comparative, probabilistic and molecular modeling

UNIT V ALGORITHMS
Classification algorithms, implementing algorithms, biological algorithms, bioinformatics tasks and corresponding algorithms and algorithms and bioinformatics software; Data analysis algorithms – Sequence comparison, Substitution matrices and sequence alignment optimal algorithm; Prediction algorithms – Gene prediction, Phylogenetic prediction and protein structure prediction algorithms.

TOTAL: 45 PERIODS

TEXT BOOKS:
REFERENCES:
3. Lukas K. Beehler and Hooman H. Rashidi, Bioinformatics basics Applications in biological science and medicine, Taylor and Francis Group, 2005,
UNIT I INTRODUCTION

UNIT II TQM PRINCIPLES
Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – PDSA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I

UNIT IV TQM TOOLS & TECHNIQUES II

UNIT V QUALITY SYSTEMS

TOTAL: 45 PERIODS

TEXT BOOK:
REFERENCES:


UNIT I  INTRODUCTION TO NANOTECHNOLOGY  9

UNIT II  FUNDAMENTALS OF NANOELECTRONICS  9

UNIT III  SILICON MOSFETS & QUANTUM TRANSPORT DEVICES  9
Quantum transport devices based on resonant tunneling:- Electron tunneling – resonant tunneling diodes – resonant tunneling devices; Single electron devices for logic applications:- Single electron devices – applications of single electron devices to logic circuits.

UNIT IV  CARBON NANOTUBES  9
UNIT V  MOLECULAR ELECTRONICS


TOTAL: 45 PERIODS

TEXTBOOKS:


AIM
To introduce the concept, terminologies, and technologies used in modern data communication and computer networking.

OBJECTIVES:
To introduce the students the functions of different layers.
To introduce IEEE standard employed in computer networking.
To make students to get familiarized with different protocols and network components.

UNIT I   PHYSICAL LAYER
Data Communications – Networks - Networks models – OSI model – Layers in OSI model – TCP / IP protocol suite – Addressing – Guided and Unguided Transmission media
Switching: Circuit switched networks – Data gram Networks – Virtual circuit networks Cable networks for Data transmission: Dialup modems – DSL – Cable TV – Cable TV for Data transfer.

UNIT II   DATA LINK LAYER
Data link control: Framing – Flow and error control –Protocols for Noiseless and Noisy Channels – HDLC
Multiple access: Random access – Controlled access
Wireless LANS : IEEE 802.11–Bluetooth.
Connecting LANS: Connecting devices - Backbone networks - Virtual LANS
Virtual circuit networks: Architecture and Layers of Frame Relay and ATM.

UNIT III   NETWORK LAYER
UNIT IV TRANSPORT LAYER


UNIT V APPLICATION LAYER


TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
1. Wayne Tomasi, “Introduction to Data Communication and Networking”, 1/e, Pearson Education.
UNIT I  INTEL ADVANCED PROCESSORS  7
80186, 80286- Architecture, Programming enhancements, 80c188EB interfacing

UNIT II  INTEL 80386, 80486 PROCESSOR  10
80386- Introduction, Special 80386 registers, Memory management, Protected mode, virtual
8086 mode, memory paging mechanism, 80486 Microprocessor – Introduction and
architecture.

UNIT III  PENTIUM PROCESSORS  10
Pentium Architecture- Memory Management- New Pentium instructions - Pentium Pro
microprocessors - Pentium II, Pentium III, Pentium 4- Special Features and Software changes.

UNIT IV  PC HARDWARE OVERVIEW  10
Functional Units & Interconnection, New Generation Mother Boards 286 to Pentium 4 Bus
Interface- ISA- EISA- VESA- PCI- PCIX., Memory and I/O Port Addresses, Peripheral
Interfaces and Controller.

UNIT V  PC BASED DATA ACQUISITION  8
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.

TOTAL: 45 PERIODS

TEXT BOOKS:
1. B.B.Brey The Intel Microprocessor 8086/8088/80186/80188,80286,80386,
2. 80486 Pentium, Pentium Pro, PII, PIII & IV Architecture, Programming &
3. N.Mathivanan, PC-Based Instrumentation concepts and practice, Prentice Hall of India,
   New Delhi, 2007.
REFERENCES:
UNIT I  REFRIGERATION CYCLES & REFRIGERANTS  

UNIT II  SYSTEM COMPONENTS  

UNIT III  CYCLING CONTROLS AND SYSTEM BALANCING  
Pressure and Temperature controls. Range and Differential settings. Selection and balancing of system components - Graphical method.

UNIT IV  PSYCHROMETRY  
Moist air behaviour, Psychrometric chart, Different Psychrometric process analysis.

UNIT V  AIR CONDITIONING  

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:
UNIT I MEMS AND MICROSYSTEMS
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 MICROSENSORS AND ACTUATORS
Mechanics for MEMs design- static bending of thin plates, mechanical vibration, thermomechanics, fracture and thin film mechanics. Mechanical sensors and actuators – beam and cantilever – microplates, strain, pressure and flow measurements, gyroscope, piezoactuator. Thermal sensors and actuators- micromachined thermocouple probe, Peltier effect hat pumps, thermal flow sensors

UNIT III MICRO OPTO ELECTRO MECHANICAL SYSTEMS
Fundamental principle of MOEMS technology, light modulators, beam splitter, microlens, digital micromirror devices, light detectors, grating light valve, optical switch

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

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 hybridization

TOTAL: 45 PERIODS
TEXT BOOKS:

REFERENCE:
AIM
To understand functioning and usage of electromechanical units which will restore normal functional ability of particular organ which is defective temporarily or permanently.

OBJECTIVES:
To study various mechanical techniques that will help failing heart.
To study the functioning of the unit which does the clearance of urea from the blood.
To understand the tests to assess the hearing loss and development of electronic devices to compensate for the loss.
To study the various orthodic devices and prosthetic devices to overcome orthopaedic problems.
To understand electrical stimulation techniques used in clinical applications.

UNIT I CARDIAC ASSIST DEVICES 9
Principle of External counter pulsation techniques, intra aortic balloon pump, Auxillary ventricle and schematic for temporary bypass of left ventricle, prosthetic heart valves.

UNIT II HEMODIALYSERS 9
Artificial kidney, Dialysis action, hemodialyser unit, membrane dialysis, portable dialyser monitoring and functional parameters.

UNIT III HEARING AIDS 9
Common tests – audiograms, airconduction, boneconduction, masking techniques, SISI, Hearing aids – principles, drawbacks in the conventional unit, DSP based hearing aids.

UNIT IV PROSTHETIC AND ORTHODIC DEVICES 9
Hand and arm replacement – different types of models, externally powered limb prosthesis, feedback in orthodic system, functional electrical stimulation, sensory assist devices.

UNIT V RECENT TRENDS 9
Transcutaneous electrical nerve stimulator, bio-feedback.

TOTAL: 45 PERIODS
TEXT BOOKS
AIM
To introduce the technology, design concepts and testing of Very Large Scale Integrated Circuits.

OBJECTIVES:
To learn the basic CMOS circuits.
To learn the CMOS process technology.
To learn techniques of chip design using programmable devices.
To learn the concepts of designing VLSI subsystems.
To learn the concepts of modeling a digital system using Hardware Description Language.

UNIT I  CMOS TECHNOLOGY
A brief History-MOS transistor, Ideal I-V characteristics, C-V characteristics, Non ideal I-V effects, DC transfer characteristics - CMOS technologies, Layout design Rules, CMOS process enhancements, Technology related CAD issues, Manufacturing issues

UNIT II  CIRCUIT CHARACTERIZATION AND SIMULATION
Delay estimation, Logical effort and Transistor sizing, Power dissipation, Interconnect, Design margin, Reliability, Scaling- SPICE tutorial, Device models, Device characterization, Circuit characterization, Interconnect simulation

UNIT III  COMBINATIONAL AND SEQUENTIAL CIRCUIT DESIGN
Circuit families –Low power logic design – comparison of circuit families – Sequencing static circuits, circuit design of latches and flip flops, Static sequencing element methodology-sequencing dynamic circuits – synchronizers

UNIT IV  CMOS TESTING
Need for testing- Testers, Text fixtures and test programs- Logic verification- Silicon debug principles- Manufacturing test – Design for testability – Boundary scan
UNIT V SPECIFICATION USING VERILOG HDL

Basic concepts- identifiers- gate primitives, gate delays, operators, timing controls, procedural assignments conditional statements, Data flow and RTL, structural gate level switch level modeling, Design hierarchies, Behavioral and RTL modeling, Test benches, Structural gate level description of decoder, equality detector, comparator, priority encoder, half adder, full adder, Ripple carry adder, D latch and D flip flop.

TOTAL: 45 PERIODS

TEXTBOOKS:
2. Uyemura J.P: Introduction to VLSI circuits and systems, Wiley 2002

REFERENCES:
4. J.Bhasker: Verilog HDL primer, BS publication, 2001
### UNIT I  ENGINEERING ETHICS  9

### UNIT II  ENGINEERING AS SOCIAL EXPERIMENTATION  9
Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study

### UNIT III  ENGINEER’S RESPONSIBILITY FOR SAFETY  9

### UNIT IV  RESPONSIBILITIES AND RIGHTS  9

### UNIT V  GLOBAL ISSUES  9

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**
REFERENCES:

AIM
To study the image reconstruction techniques

OBJECTIVES:
To study in detail, the processing techniques used in various imaging modalities.
To study the quality assurance test for radiography, method of recording sectional images
To study the functioning of radioisotopic imaging equipments
To study the MRI, image acquisition and reconstruction
To study the 3-D image display techniques

UNIT I ULTRASOUND IN MEDICINE
Production of ultrasound – properties and principles of image formation, capture and display – principles of A-mode, B-mode and M-mode display – Doppler ultrasound and colour flow mapping – applications of diagnostic ultrasound.

UNIT II X-RAY COMPUTED TOMOGRAPHY

UNIT III MAGNETIC RESONANCE IMAGING
Principles of MRI pulse sequence – image acquisition and reconstruction techniques – MRI instrumentation magnetic gradient system RF coils – receiver system functional MRI – Application of MRI

UNIT IV RADIO ISOTOPIC IMAGING
Rectilinear scanners – linear scanners – SPECT – PET Gamma camera radio nuclides for imaging – emission computed CT

UNIT V INFRA RED IMAGING
Physics of thermography – imaging systems – pyroelectric vidicon camera clinical thermography – liquid crystal thermography

TOTAL: 45 PERIODS
TEXT BOOK:

REFERENCES:
1. A. C. Kak, “principles of computed tomography”, IEEE press, Newyork
2. G. A. Hay, “Medical Image formation perception and measurement”,
UNIT I   Fuzzy Set Theory

UNIT II   Optimization

UNIT III   Artificial Intelligence

UNIT IV   Neuro Fuzzy Modeling

UNIT V   Applications of Computational Intelligence

TOTAL: 45 PERIODS
TEXT BOOKS:

REFERENCES:
UNIT I  INTRODUCTION  10
Basic operation-impact of rapid prototyping and tooling on product development-benefits-applications

UNIT II  RAPID PROTOTYPING PROCESSES  10
Introduction-classification-laminated object manufacturing-fused deposition modeling-stereolithography-solid ground curing-selective laser sintering-3 D printing.

UNIT III  CAD PROCESSES  10

UNIT IV  MATERIALS FOR RAPID PROTOTYPING  5

UNIT V  RAPID TOOLING PROCESSES  10
Introduction-classification-indirect rapid tooling-silicone rubber moulding-epoxy moulding-electro forming- vacuum casting- vacuum forming- rapid tools for injection moulding-direct rapid tooling processes-SLS rapid tool-shape deposition manufacturing – laser deposition lamination- rapid tooling roots.

TOTAL: 45 PERIODS
TEXT BOOK:

REFERENCES:
1. PAUL F.JACOBS, Rapid Prototyping and Manufacture. Fundamentals of Stereolithography, 1995
2. Rapid prototyping reports, CAD/CAM publishing, 1991
4. Rapid Tools for Injection Moulding
   ( www.vmreg.com/raptia/reports/CRI.pdf ) Applications of RP techniques for Sheet Metal Forming ( www.raptia.org )
   Medical RP applications
   (http://home.att.net/~rppat/museum/mus-5.htm)
UNIT I FUNDAMENTALS OF CANCER BIOLOGY


UNIT II PRINCIPLES OF CARCINOGENESIS


UNIT III PRINCIPLES OF MOLECULAR CELL BIOLOGY OF CANCER


UNIT IV PRINCIPLES OF CANCER METASTASIS


UNIT V NEW MOLECULES FOR CANCER THERAPY


Total: 45
TEXT BOOKS

REFERENCES